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The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*
Editorial Offices: Investment Bldg., Washington, D. C.

VOLUME XX NUMBER TEN

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American Potash Institute, Inc.
Investment Building, Washington, D. C.

J. W. TURRENTINE, *President and Treasurer*
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VACATION TIME—WITH ROMANCE IN THE AIR!

Better Crops with Plant Food

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Vol. XX WASHINGTON, D. C., JUNE-JULY 1936 No. 10

Jeff Opines That—
Graduation Is Not

"Quit-uation"

Jeff McDermid

GLANCE back with me to those days of peg-top pants and pompadours. Remember how the old high-school bunch of the nineties lightly referred to June diploma-time as "quit-uation" day? We were panting for the final release from discipline amid a sticky season when indoor tasks were irksome; and many a useless discussion arose over why they called the end of formal schooling, "commencement."

I am sure we little realized that it *was* commencement, and that we would quickly assume duties to deprive us of the fish pond and the ball grounds with sterner routine than any we had encountered within the classroom.

No doubt a majority of that thoughtless generation has since yearned for more learning, and we look back upon many a crabbed teacher as one does upon blessings lost before they are appreciated. Yet I do know that there was no such youthful protest over lack of educational opportunity as we have today, nor such a compelling sense among elders that one need not stop mental growth after squeezing through high school or college with small margins to spare. In those days schools were not so pleasantly conducted, and the world had not found its need for living facts and varied experiences so imperative.

But with much more knowledge to acquire in 1936 than in 1906, and more need for better training to keep youth abreast of the mighty waves of progress and invention, what do we

find upon delving into a few recent pages of that amazing daily storehouse, the *Congressional Record?*

From five million to eight million young people between the ages of 16 and 25 are wholly unoccupied in this land of ours. They are neither working nor attending school. This means that idleness through no fault of their own possesses a mass of young folks equal in number to the whole population of this country in 1800 and about that of the present residents of New York City. Seven hundred thousand young folks had to stop their high school courses last year for lack of funds, despite the National Youth Administration. What will the labor market offer for the thousands of graduates released from academic gates this summer?

We will either do something for our young people and do it soon, or else they will do something to us.

Speaking out in meeting is a new habit with the folks who were infants a few years ago and were told to be "seen but not heard." At a Detroit youth congress last July, their ringing declaration of independence called for "guarantees of a full educational opportunity, leading to a happy, useful, and creative life, employment at adequate wages, security in time of need, civil rights, peace, a free press, freedom of speech, and rights of assemblage." If anybody thinks that is bumptious stuff, turn back to the American revolution.

MEMBERS of Congress are awake to the fact that we must apply remedies to this condition in two ways. We must cause our youth to remain in educational institutions longer and enter the labor market later; and we must provide for an adult educational system which will enrich our public opinion and help to deliver us from dogma. For we now know that there is no such thing on earth among sane citizens as a "quit-uation" time.

Go through a modern steel plant. Note carefully the exactness and marvels of metallurgical chemistry, the tests made of every conceivable kind in the laboratory, and the delicate precision of the equipment therein; and from there visit the Bessemer furnaces and observe what mammoth and ponderous weights of white-hot flux are handled by a few tiny men. If men can conquer such vast odds, why can't some genius forge the link between those who need education and work and the potential demand necessary to put the economic world into gear again?

THIS perplexity keeps bobbing up as a challenge to us all, and it reaches its crest as the hopeful graduates march down to get their parchments from the school board this pleasant June time. Even though a temporary improvement in conditions has come, the same old threat is with us, like buried roots of quack grass, ready to bud and sprout unless heroic measures are taken to prevent it. It's our job to see that the high-school and college commencement means just that, and not stagnation.

I wonder if there was anything "wistful" about me or my chums when we "quit-uated" that day in June three decades ago. I know there has been since, but that's another matter. Last night my wife rigged up our eldest girl in her dotted Swiss commencement gown. Somehow I could see something sort of wistful in both of them, standing there in the twilight. One was happy, flushed and radiant over the truce following her French conquest and a couple of rows of other A marks (which she could trace to hard work rather than inheritance), and the other was hiding some of her feelings in that matronly reserve and dignity which endears her to us all.

When daughter was in the lower grades she found us of some help

when the road to erudition was a little rough in spots. I am still able to do my fractions and I have a faint glimmer of grammar. The things I absorbed from 10 to 15 have stuck with me, but it's not so good for the upper teens and twenties. So when our girl began toting home algebra, geometry, classic poetry, and medieval history, with a few tomes on social problems thrown in besides, my ability to graze in old pastures watered by Pierian springs was blocked by mental indigestion. It was like going hand-in-hand with a friend along an ascending path toward a summit where glorious scenes abound, and then being stricken blind when you expected to point out vista dimly recalled as being wonderful to behold.

So I think I need to be re-educated. How about you?

Too many parents send their children on to college so that the offspring may get polished, and sometimes in the case of the boys, all they get is a good shine. When the youngsters return and fail to adapt themselves properly to a ready-made niche cut out for them, a universal howl soars aloft that the academies are a failure and a waste of hard-earned cash.

We razz the courses with frills and exclaim that such trash is of no use in a practical world. How do we know, to be exact about it, whether the college or the world is at fault? Maybe it's the older folks who are out of tune and maybe it's the lack of culture, inspiration, and intellect in our everyday lives that withers the fruit of our colleges as soon as it is harvested. Yes, indeed, too many of us just "quit-uated" one summer day and never resumed where we left off. If elders wish to be companions and friendly, understanding guides for newly graduated youth, their job is to cultivate the mind while they are raising the mazuma.

Cultural education for folks past school years can be amply defended on other grounds than its value as an aid to growing and developing youth. That is, we can be a little selfish about it, too. Our zeal to provide opportunities for polishing off the youngsters need not preclude us elders from imbibing some generous quaffs of elixir ourselves. Apparently, vocational courses are paving the way.

I think it is nothing to be wondered at that so many young people are impatient to study along lines leading them to greater and steadier earning power. Maybe if we couple that up with adult education later in life, they can get the practical stuff first and the fancier courses later, if necessary.

It is astonishing to note the enrollment in 1935 simply in those schools teaching courses of a practical nature which received Federal aid. About 1,200,000 persons studied in vocational and continuation schools last year. Wage-earning youths over 14 years, learning while earning in cities, and farm boys in rural high schools each comprised 18 per cent of the total. Wage-earning adults in city evening schools numbering 155,000, or 13 per cent of the total; 135,000 rural and urban women training for better home-making, or 12 per cent of the total; together with 175,000

(*Turn to page* 44)

The Role of Potassium *In* Plant Nutrition

By Dr. W. L. Powers

Soil Scientist, Oregon State Agricultural College, Corvallis, Oregon

POTASSIUM has long been included among the more important fertilizer constituents although most soils are relatively higher in their content of total potassium than of nitrogen or of phosphorus, and less potassium is removed in the marketable portions of plants or retained by animals. However, it has been the experience of farmers that continued cropping for half a century may result in a deficiency of readily available potassium.

A small amount of potash is present in the soil solution and is readily available to plants. A somewhat larger supply of potassium exists in association with the ultra-clay fraction of the soil in nearly available or exchange form. It is this form largely that replenishes the soil solution of normal soils. There is a reserve supply of potassium present in the soil in relatively insoluble soil minerals, principally feldspars. Water-soluble potassium tends to be absorbed or fixed in the clay fraction, and it is thus retained against leaching, while erosion, upward leaching, or translocation by plant roots from the subsoil into the surface may tend to replenish soil potassium-supplying power. The roots of certain plants may etch out potash directly from the fine feldspars, and this potash returned as crop residue may be absorbed and held in exchange form in the soil.

There are two classes of soils of considerable extent that may be expected to be naturally deficient in potash, namely, sands and peats. Sand soil high in silica may contain some potassium in insoluble or undecomposed silicate form. Peat soils are generally low in minerals, being made up largely of plant remains and the potash therein contained is rather subject to leaching. The conditions under which peat occurs are favorable for leaching. Two soil areas in the Northwest that have been found to be relatively low in available potassium are certain

Mint response to potash—left, untreated; right, potassium sulfate.

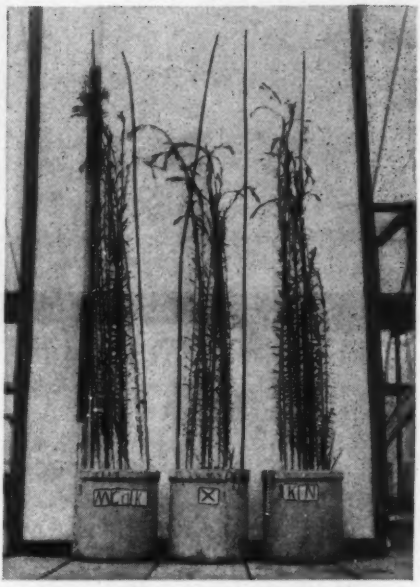
sandy soils and the peat and muck soils, especially in the humid sections of the Pacific Northwest. The average total potash content of peat in the Willamette Valley, Oregon, is approximately 2,000 pounds in the plowed depth of an acre; whereas, the adjacent bench land of Willamette silt loam, which is one of the most representative soils of the Valley, contains an average of approximately 33,000 pounds of potassium. The sandy Deschutes, Oregon, soils contain a fair total supply of potassium, or on the order of 20,000 pounds to plow depth of an acre, which is 1%.

The readily available replaceable or base exchange potassium in peat soils is very low, although the exchange capacity of these soils is very large. The sandy Deschutes soils, on the other hand, have a low clay content and only a medium capacity for exchange bases. They are subject to leaching where irrigated. It may be expected that on such a soil a light application of potash might be more effective than on peat, unless there be an absolute deficiency in the peat before treatment.

In some soils potash added will enter into a replaceable form. In other soils much of the potash added may become non-replaceable. Availability of exchange potassium will be affected by the kind of crop, stage of growth, proportion of other exchange bases present, constitution of the exchange complex, and the amount of wetting and drying as affected by climate and season, potash being more effective in unfavorable seasons. Crops also vary in their ability to secure potassium directly from fine particles of feldspar. Potassium is an essential plant nutrient and is radioactive.

Potassium is known to go to the stems, increases mechanical strength, and is returned to the soil largely in the straw.

It has been found to increase the sugar content of berries, grapes, and



Fiber flax—left to right: manure, lime, and potash; untreated; potash and nitrate.

beets in experiments in Michigan, England, and Germany, respectively.

Increases in starch in rice and bulbs have been reported, and potash is probably essential for carbon dioxide assimilation.

Increased oil content of pecans due to potash was reported by the Bureau of Chemistry and Soils in Louisiana experiments.

Potash was found to make peas more tender at the New York State Experiment Station.

It caused stronger epidermis with better protection from infection.

Potash is reported to increase the keeping quality of oranges and cabbages.

It is supposed to be a promoter of color, cell division, synthesis of proteins, and activity of enzymes and nitrifying micro-organisms.

Deficiency of potash may cause leaf scorch and tip burn, or spotted leaves.

In Oregon experiments potash seems to increase the length and strength and proportion of fiber in flax, and its resistance to wilt.

Potash has trebled the yield and im-

The mint at the left received no treatment; that at the right had potassium sulfate.

proved the quality of mint oil by all the standard chemical tests for the three years where mint was grown on Oregon peat.

Potash has increased the yield, firmness, and the starch and dry-matter in potatoes on certain Oregon mucks.

Where the supply of available potassium is unfavorably low, potash fertilization tends to increase the potash content of the plant. Where the supply of available potassium is large, "luxury" consumption may occur.

Potassium is absorbed best from a neutral solution and by young plants. A low concentration is adequate, if maintained.

The effect of using different kinds of potash carriers upon the quality of potatoes is shown in the data presented in Table I. Tables II and III show the effect of potash fertilizers on the yield and composition of mint oil.

In connection with potash trials on sandy soils in the Deschutes Valley, Oregon, some studies of various potash carriers and also the rate of application were made. A further trial of potassium sulfate at different rates not in-

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TABLE I. FERTILIZER TRIAL WITH POTATOES ON MUCK
(From J. Lewis Plots—Clatskanie, Oreg., 1928)

Treatment	Yield bushel acre	Cooking test relative rank (Av. 5 tests)	Moisture in potatoes, per cent	Pressure test (Av. of 31 trials) lbs. causing rupture
Checks (Av. of 5)	126.6	5th	75.9	36.7
K_2SO_4	180.0	1st	75.5	37.9
K_2SO_4, Superphosphate, and $(NH_4)_2SO_4$	160.0	4th	78.5	35.2
KCl, Superphosphate, and $(NH_4)_2SO_4$	172.5	3rd	77.7	36.5
Manure, Lime, KCl	339.5	2nd	79.4	38.2
1929				
Checks (3)	153.3	4th	79.0	30.0
KCl	200.0	2nd	79.3	35.3
K_2SO_4	195.5	1st	79.1	36.9
Manure	236.6	3rd	79.2	35.5

Keeping Up-to-Date With Potatoes

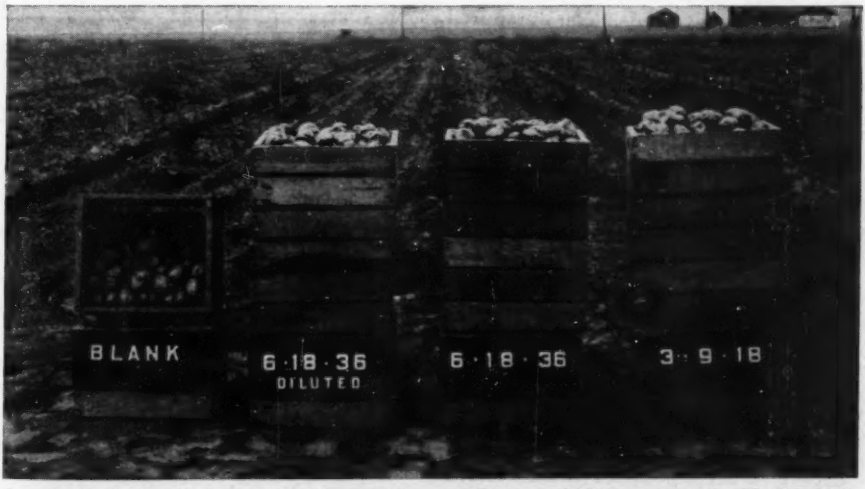
By Arthur O. Braeger
Wisconsin College of Agriculture, Madison, Wisconsin

THE "latest thing" in potato raising is the use of fertilizers high in potash and phosphate. Since 1929 high-potash fertilizers have come into favor, and at the present time the 3-9-18 mixture is the most widely used.

The first widely used mixture of the old eastern potato regions was the 5-8-7. Wisconsin potato growers in 1929 used about 8,000 tons of commercial fertilizer. Of the mixtures distributed that year, the 3-10-10 and 3-10-12 analyses were well in the lead.

Nearly 80 per cent of the Wisconsin farms are growing potatoes to some extent. Many farms mean many soil types. Different soils, in turn, mean different growing practices. The farmer raising potatoes on a peat soil will use a fertilizing program different from that used by the sandy soil potato-raiser.

J. G. Milward and J. W. Brann, potato specialists at the Wisconsin College of Agriculture, and A. R. Albert of the Hancock Experiment Station have conducted numerous trials on raising potatoes in light sandy soils. These men have found that fertilization of the preceding legume crop is the best and safest practice for potatoes on light sandy soil. If the legume crop is partly used for live-



In general the double strength mixtures produce equally good yields as compared with the single strength where the ratio of plant food is the same. In using these higher analyses fertilizers, care should be taken to distribute well in the soil because of possible injury to germination.

This excellent stand of potatoes on the farm of E. E. Webster in Oneida county shows what can be done with a 3-9-18 fertilizer on sandy soil.

stock feeding, the fertilizer charge falls less heavily on the potato crop. Enough but not too much lime for the better legumes, potash and phosphate for all legumes, and a complete high-nitrogen fertilizer or manure for the non-legumes are their recommendations.

Milward explained that direct commercial fertilizer, carrying nitrogen, phosphorus, and potassium, should be applied along the row as deep as and beside the seed pieces at planting, or side-dressed later, or both. On sands and sandy loam soils the potash ratio may be about 1-3-4 on manured, legume-fertilized sod; 1-3-6 for manured, legume-unfertilized sod; 2-3-8 for unmanured, legume-unfertilized sod; 2-3-4 on unmanured, legume-fertilized sod. On loams and silt loams, the potash may be reduced 25 to 50 per cent.

Brann pointed out that depending on soil fertility, grade of fertilizer, moisture supply, and prospective potato prices, the application may range from 250 to 750 pounds an acre. On light soil no more than 400 pounds per acre of the common grade of fertilizer should be applied at one time. If more is to be used, side-dress half the application at the second or third cultivation and apply the other half at planting or side-dress with a blind cultivation a few days after planting.

In seasons of adequate rainfall and fair prices, row fertilizer application for late potatoes on sandy and sandy loam soil, which has been well prepared otherwise, will usually give good returns, according to these men. They believe that over a period of years the average increase is not likely to pay for the cost. If manure is plowed under with a good legume sod or green manure, adequate rainfall will insure a good crop of late potatoes. If the season is very dry, the additional row application of fertilizer will not be profitable. These specialists say that the better the water-holding capacity of the soil, the more desirable are row applications.

Early potatoes that make growth before ample plant foods are available are benefited by row application and usually bring better prices.

Success Due to Potash

Some of the well-known potato producers in Oneida county, Paul Bonach, Thomas Meredith, and E. E. Webster, have been using a 3-9-18 fertilizer on their sandy soils. They report excellent results from this mixture.

It is estimated that there are about 2,000,000 acres of peat soils in Wisconsin. Through the use of potash, potatoes have been grown very successfully on this soil. In recent years there has been a large investment in potato planting on a commercial scale on this type of soil. James Isherwood, Plover, and the owners of the Turtle Valley Farms, Delavan, raise excellent crops of potatoes on peat soils with an 0-9-27 fertilizer.

On medium loam soils in Langlade

(*Turn to page* 37)

Potash & Cotton Wilt In Central & North Mississippi

By Dr. L. E. Miles

Agricultural Experiment Station, State College, Mississippi

THE toll of cotton wilt, caused by the soil-borne parasite, *Fusarium vasinfectum*, has been experienced personally by a large majority of the cotton growers in Mississippi. On some this toll has been extremely heavy. On others, more fortunate in that their soils were less heavily infested, or in that they happened fortuitously to be growing a variety more resistant to the attacks of the fungus, or more provident in that they have sought for and, having secured it, followed advice regarding these resistant varieties, the levy has been lighter, though in most cases, still evident.

Crop rotation, a sanitary, precautionary measure usually recommended as sound practice against many plant diseases, is scarcely practicable with such a crop as cotton. Cotton is generally planted on large acreages, and, even were rotation practicable, it has been shown to be ineffective against the wilt organism which seems to be able to live almost indefinitely in the soil once it has been introduced, retaining its ability to attack cotton when it is eventually put back on the land.

Many varieties of cotton highly resistant to wilt have been developed. Other varieties less resistant but tolerant of wilt are available. Many growers, however, are indisposed to the use of these varieties for the reason that they do not possess in a high

Left (no fertilizer) wilt infection, 39.9%—yield, 199 pounds seed cotton. Right (600 pounds 4-8-4) wilt infection, 13%—yield, 987 pounds seed cotton.

Left (1,200 pounds 4-8-4) wilt infection, 5%—yield 1,125 pounds seed cotton. Right (no fertilizer) wilt infection, 23%—yield, 395 pounds seed cotton.

degree certain other characteristics which they consider essential to a good cotton. Progress is being made, and within a few years one may expect to secure varieties of cotton possessing a high degree of wilt resistance in combination with other desirable characteristics to suit the demands and idiosyncrasies of most growers.

Search Simple Treatment

The ideal control measure for such a soil-borne disease as cotton wilt would be, of course, some simple soil treatment, such as the application of some relatively inexpensive material in amounts within the range of economic practicability, which would not only control the disease but would also produce increases in yield, large and profitable, over and above those which might be expected from disease control alone. Cognizance has been taken of the desire for such a control measure, and tests have shown that the result aimed at has, in some measure at least, been attained.

In a previous article appearing in the last issue of this publication it was shown that potash, in combination with the necessary fertilizer elements in a balanced ratio, was instrumental and quite effective in reducing the incidence of and the damage from cotton wilt in the light soils of south Mississippi. In this article tests will be presented to show that the same effects are produced by potash on soils of various types in other parts of the state.

In 1928 a test was begun at the Main Experiment Station at State College to determine the effect of various fertilizer elements on cotton wilt under the soil conditions prevailing at that place. Nitrogen, provided by nitrate of soda, was varied through 0, 4, 5, 6, and 8 per cent. Phosphorus, from acid phosphate, varied through 4, 6, 8, and 10 per cent, and potash in the form of muriate of potash, through 0, 4, 5, 6, and 8 per cent. The basic rate of application of the respective fertilizer mixtures was 600 pounds per acre. One plat was given, in addition to the 4-8-4 mixture, an application of lime at the rate of 2 tons per acre. Two other plats were treated with a 4-8-4 mixture at the rate of 900 and 1,200 pounds per acre. Lone Star 65 cotton was planted, and all plats were run in triplicate. The test was continued

Left (no fertilizer) wilt infection, 40%—yield, 199 pounds seed cotton. Right (600 pounds 4-6-4) wilt infection, 11%—yield, 856 pounds seed cotton.

through 1932. It became necessary, however, to change the location of the plats in 1931 and, since the distribution of the wilt organism in the soil in the new location was not sufficiently uniform, the data secured in the new location have been omitted from consideration in the results presented. Wilt counts were begun shortly after chopping was completed and were repeated at approximately monthly intervals throughout the season.

In the first wilt counts each year there was very little infection in evidence, and the difference between the amounts in the various fertilizer treatments was too small to have any significance. There was invariably, even in these early counts, more wilt infection on the check plat and on the no-potash plat than on any other. It was only in the later readings that the amounts of wilt present and the differences in amount between the various fertilizer treatments began to be significant.

In Table I are presented the results secured over the 3-year period from

(*Turn to page* 40)

TABLE I. FERTILIZER ANALYSIS TEST WITH REGARD TO WILT INFECTION, MAIN EXPERIMENT STATION, STATE COLLEGE, 1928-30

Treatment	Per cent Wilt Infection				No. Lbs. Seed Cotton per Acre			
	1928	1929	1930	3-yr. ave.	1928	1929	1930	3-yr. ave.
Check ..	39.9	23.12	15.8	26.28	199.4	395.6	212.5	269.12
4-8-0 ...	60.0	23.00	12.0	31.67	462.0	728.7	300.0	496.90
4-8-4 ...	13.0	9.08	8.3	10.13	987.0	1,135.0	487.5	869.83
4-8-8 ...	15.7	3.40	4.3	7.81	990.0	1,207.5	491.2	896.25
0-8-4 ...	18.0	8.23	8.3	11.52	777.0	875.0	353.7	668.58
6-8-4 ...	13.5	5.55	8.0	9.02	987.0	1,135.0	491.2	871.08
8-8-4 ...	15.2	6.03	5.0	8.74	1,008.0	1,135.0	433.7	858.91
4-4-4 ...	17.3	7.67	8.5	11.18	915.9	1,145.4	441.2	834.18
4-6-4 ...	11.0	4.06	6.0	7.02	855.9	1,250.0	395.0	833.63
5-10-5 ..	8.3	4.43	10.0	7.57	1,032.0	1,322.5	512.5	955.66
4-8-4 lime .	15.0	7.15	8.3	10.17	783.9	1,135.0	395.0	771.30
4-8-4 900 lbs.	15.0	4.97	6.7	8.87	1,063.9	1,291.2	482.5	945.86
4-8-4 1200 lbs.	17.3	5.10	2.7	8.35	933.2	1,125.0	495.0	851.07

The Inquiring Mind And the Seeing Eye

By Alister B. Alexander

Madison, Wisconsin

WE HAVE all heard of the work that is being done in soil erosion control, but few of us probably realize the magnitude of the problem, nor do we realize the tremendous losses that take place each year as a result of the washing away of valuable topsoils. For that reason we are visiting this month the man who has done more to make the United States "soil erosion conscious" than anyone connected with soil control work—H. H. Bennett, Chief of the Soil Conservation Service of the United States Department of Agriculture.

Resourceful Upbringing

Hugh Hammond Bennett was born on a farm near Wadesboro, N. C., on April 15, 1881. The soil was none too good, lying as it did in the Triassic sandstone region of the Piedmont, but the senior Bennett, who had come out of the Civil War with plenty of land and very little of anything else, managed to make the farm pay and to put nine children through college. Those were the days when farms were self-sustaining.

There was a cotton gin on the place, and young Hugh used to perch proudly on the arm of the cog wheel and drive the mule power around. The farm blacksmith shop made its own bolts, nuts, plows, and tools, and even did its own horseshoeing. Equipment was given new parts when needed from the farm shop. Socks were home knitted; shoes were made on the farm from leather obtained from the near-by tannery. Homespun cloth was dyed bluish with copperas and tulip-poplar bark.

Good things to eat were produced at home—corn, wheat, potatoes, milk, butter, chickens, turkeys, eggs, hogs, beef, honey, and vegetables. Cotton was the money crop. Flour was ground at the community grist mill. "Big hominy" was made at home, and the smokehouse produced hickory-smoked hams, sausage, and bacon. Pepper, sage, horseradish, and other condiments came from the home garden. The persimmon trees of the neighborhood produced possums, and the draws furnished snapping turtles.

In this atmosphere of plenty of simple home food, and simple home-made clothes, Hugh Bennett grew and thrived. He even rode 4 miles to school each day on a mule, with a fertilizer sack for a saddle. And out of this atmosphere has come Hugh Bennett the soil expert, 6 feet and 1 inch tall, who loves his native Carolina, loves his food, and loves his work.

H. H. Bennett received his Bachelor of Science degree from the University of North Carolina in 1903 and immediately entered the Bureau of Soils of the United States Department of Agriculture as a soil chemist. He was temporarily assigned to field duty on one of the soil surveys in Tennessee, and liked the work so much that he

asked to be left on field duty. Although he has done soil survey work in scores of counties of the United States, his field of operations has not been limited to this country. He spent two years making soil surveys in Alaska, additional years in Cuba, parts of South America, the West Indies, and the whole of Central America and the Canal Zone.

In 1909 he was made a member of the committee appointed at the request of Gen. Goethals to report on the agricultural possibilities of the Canal Zone. In 1914 he took charge of an agricultural expedition to Alaska to explore the agricultural possibilities of the regions being considered for the location of a Government railroad, and in 1916 was a member of the Chucagh National Forest Commission in Alaska. During 1918 Hugh Bennett served as an engineer officer in the World War and, upon his return in 1919, became a member of the Guatemala-Honduras Boundary Commission.

HUGH HAMMOND BENNETT

In 1923 and 1924 he explored the possibilities of rubber production in the Americas and went on to Cuba in 1925 to make a 2-year soil survey in cooperation with the Tropical Plant Research Foundation, following this trip with further cooperation with the same commission until 1932. He directed classification of lands and reorganization of plantation procedure on land use on the principal sugar centrals of Cuba, including about 80 plantations representing some of the largest farms in the world. In 1934 Mr. Bennett was appointed Director of the Soil Erosion Service of the Department of the Interior and remained as chief of the service when the work was transferred to the Department of Agriculture in 1935.

Early Interest in Soil-saving

During all of these years Hugh Bennett devoted a great deal of time to studies of soil erosion and methods of erosion control. He is the author of numerous technical and popular articles on the problems of accelerated erosion, and of two books dealing with the subject of land, "The Soils and Agriculture of the Southern States" and "The Soils of Cuba." He is a member of the American Society of Agronomy, the International Society of Soil Sciences, American Forestry Association, American Soil Survey Association, Association of American Geographers, and the Southwestern Soil and Water Conservation Conference.

In an address given before the North Carolina Crop Improvement Association at High Point, N. C., on February 13, 1936, Hugh Bennett gives an excellent story of his interest in soil-erosion work, and his early interest in the problem. He said at that time, "I remember when I was 9 years old helping my father lay out our first terrace. We used a wooden-horse with a water level on it. I dug the holes to guide his one-horse plow. I remember asking him what we were doing all this for. 'To keep the land from washing away,' he said. That

failed to impress me. The land, to my boyish eyes, was there, just as it always had been.

"In 1896 when I was 16, I stayed out of school a year to make enough money to go to college. I worked with an ax all that winter, whacking away at a beautiful stand of native hickory, oak, pine, and dogwood on Rocky Ford farm. There must have been 20 or 25 acres in the tract. I laid bare 7 inches of topsoil, underlain with about 2 feet of subsoil, or rock. I put it all in cotton. That field was used for cotton year after year. Most of the land lay on a slope of about 12 per cent. Nobody told me it was wrong to use it that way. That was 40 years ago.

"It is shocking to see that field now. The topsoil is gone, and in many places the subsoil has been bitten through and deeply gullied right down to the rock. Most of it is abandoned land now, growing up to piney scrub, gashed, ugly, all but worthless for generations to come, because of my ignorance as a boy. My brother did the same thing with another piece of ground. There were 30 acres in that piece. It is abandoned now, and some of the gullies are 15 feet deep. There were no courses or books about soil conservation then. We thought we had all the land in the world. Now we know that we have not.

Extent of Loss

"To correct the false philosophy of land use which has developed out of former conditions in this new America, it is necessary first to drive home the fact that erosion can be controlled, and then the fact that it *must* be controlled. Of the 1,906,000,000 acres of the United States, some 555,000,000 acres are crop and pasture land, good, bad, and indifferent. After only two centuries of white occupation, 50,000,000 acres of this land have been essentially ruined by accelerated erosion for farming purposes. Another 50,000,000 acres is in bad shape. In all, that means enough land gone, or nearly gone, to provide homes for 1,250,000 farm families. Besides that, still another 100,000,000 acres, still largely in cultivation, have been seriously damaged by sheet erosion, and on still another 100,000,000 erosion has just started. That leaves just about half of our farm land on which erosion has not been permitted to take toll.

Realization Important

"Those who take comfort in the thought that erosion has been with us a long time, ever since the first raindrop fell on the earth, fail to differentiate between the slow processes of geological erosion, under conditions of natural balance and cover, and accelerated removal which starts when soil is bared and tilled. It took around 400 years to make each inch of topsoil, for instance, over the greater part of northern Missouri; yet under conditions of undisturbed cover that was fast enough to replace and keep stationary that soil. Some of it slipped away from under its forest and grass cover, but it did not go away any faster than it was being made."

We all know of cases in our own memories similar to the cases quoted by Mr. Bennett. On our own farm in Wisconsin we built a hunting shack during our high-school days. The shack was set on a river-front pasture next to a hilly cornfield. When we built it—probably about 1910—we set it on cement posts, with the floor about 18 inches above ground. Over a period of years the space under the floor gradually diminished, until, in 1919 upon our return from war service, we found that the mud was above the floor level, the sills were rotted, and the door would not open. And all of this extra soil came from one small cornfield behind the cottage.

The severest loss of rich agricultural soil ever recorded took place in a bean district of California during one rain

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Fig. 1—Insuring proper distribution of fertilizer salts with soil injection rods.

Prune Die-Back

By Dr. Omund Lilleland

California College of Agriculture, Davis, California

THE sudden scorching of leaves and the dying back of limbs of well-grown Agen (French) prune trees in certain areas in the Sacramento Valley were first noted in 1917. The trouble continued to occur in the increasing acreage planted during the World War and has caused serious losses and, in many cases, the abandonment of this land for the production of prunes.

The College of Agriculture has been actively engaged in a solution since 1927, and it is my intent in this paper to discuss some of the phases of this study which may be of interest to students of plant nutrition in general, and the nutrition of fruit trees in particular.

One of the many baffling points in the early stages of the investigation was the suddenness with which the symptoms of leaf scorch and dying of twigs and often entire trees took place. In this respect the behavior was similar to that produced by a bacterial or fungous disease. In general, nutritional deficiencies are not manifested by as sudden a collapse and death as was the case with these prune trees. Nutritional deficiencies are usually associated with slow or stunted growth and often manifest themselves while the trees are still young. Leaf deficiency symptoms appear gradually.

In the case of Prune Die-back the young trees grew rapidly and were considered large for their age. There were no symptoms during the first five to eight years in the orchard. The

Fig. 2—An 8-year-old Agen prune orchard. The soil is low in potassium, yet these trees have made good growth. The picture was taken in May 1930.

first symptoms of leaf scorch often appeared rather suddenly during the summer when the trees were bearing their first heavy crop. The rapid dying of these trees is shown in the photographs in figures 2 and 3. The pictures were taken in the same orchard. Figure 2 presents the trees as they were in May 1930, healthy, uniform trees. Figure 3 presents their condition in August 1931, dead, or nearly so.

Tests of soils from Die-back areas indicated a lack of potassium. Not only were the soils low in potassium, but they exhibited a marked ability to absorb or fix this element. Fruit trees in California readily deplete the soil moisture to a depth of 4 feet, which fact indicates that soil nutrients should be distributed throughout the soil mass surrounding a fruit tree to the above depth to be most effective. The fixation of potassium by the

Fig. 3—The same orchard shown in Fig. 2 one year later. The trees are dead or almost so. The picture was taken in August 1931.

surface soil when the fertilizer was broadcast over the ground indicated the improbability of accomplishing a distribution of potassium in the tree-root zone by surface applications. The rapidity of the decline of the trees stressed the necessity of accomplishing this. The problem was solved by the development of a soil injection method using ordinary pipe fittings and a spray-rig, such as most orchardists use in the spraying of their fruit trees. With adequate pressure it was possible for two men with one spray outfit to distribute 50 gallons of a potash solution over 200 square feet at the approximate rate of one hole to every square foot to a depth of 3 feet. The time consumed was 15 minutes. The method is illustrated in Figure 1.

The results of treating trees in the manner just described are illustrated in Figure 4. The trees on the left received 10 pounds of sulfate of potash, which were dissolved in 75 gallons of water and injected into the soil in January 1927. The picture was taken in June 1929. The trees on the right received no potash. Surface applications of similar amounts failed to produce as marked a response.

While the differences produced by the application of potash to prune trees in these Die-back areas are striking, potash applications have not in any instance maintained the productivity of the orchard. The trees in Figure 4 continued to decline, those treated with potassium at a slower rate than the untreated trees.

There are evidently other contributing factors besides the potassium content of the soil to be considered in the Die-back problem. One of these is the marked tendency of trees in the Die-back areas to set very heavy crops of fruit. It has been possible in the better orchards, where the soil potassium is moderately high, to prevent a development of the scorching and dying back by merely removing the entire crop rather early in the season while the fruits were immature. The initial symptoms in an orchard are often associated with its first heavy crop.

When the potassium content is not

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Fig. 4—The prune trees on the left received 10 pounds of sulfate of potash per tree injected with 75 gallons of water into the soil in January 1927, before any injury had developed. The row on the right was untreated. The picture, taken in June 1929, shows that the addition of potassium has delayed the development of serious Die-back symptoms; however, both treated and untreated trees succumbed later.

Meet Our Old Friend *TIMOTHY*

By Ford S. Prince

Agronomist, New Hampshire College of Agriculture, Durham, New Hampshire

HISTORIANS tell us that timothy was first grown in the United States by one, John Herd, about 1747 along the banks of the Piscataqua River between Portsmouth and Dover, New Hampshire. Whether he imported the seed from England or some other European country, or whether he first found it growing wild, we are not quite certain. About this time, Timothy Hansen introduced the crop into Maryland from somewhere in New England, and while Hansen does not appear to have been the first grower, he nevertheless bequeathed his name to the crop. However, in some parts of New England and New Hampshire in particular, "Herd's Grass" it is to this day.

These men could not possibly have foreseen the importance timothy was to assume in the agriculture of the Northeast. It is the most common hay species and the most generally seeded in all hay-land and pasture mixtures. It is well adapted to the soils in the humid Northeast, and its development as an important farm crop is based upon several characteristics. It is a productive hay crop; has an excellent record in persistence; once seeded, is not subject to winter-killing; is responsive to fertility; has a longer cutting period than most hay crops; and makes excellent fodder.

As a horse hay its virtues have been widely extolled, and although many fanciers feed some clover and others feed alfalfa, timothy still holds first place in the minds of most horse men. So important did it become in the horse age that it formed the principal hay of commerce in Eastern cities, and growing hay for the market was a profitable business.

Then came the automobile. The market for hay dwindled until it is now probably not more than one-tenth its former volume. Farmers who had made a business of selling all or part of their hay must feed it on the farms, but not to horses, the class of livestock for which it had been grown.

For Dairy Cattle

As an energy-producing forage, timothy and related grasses cut after the period of bloom are second to none. But fed to cows, with milk and growth the dominant objectives, hay cut at this period under ordinary farming methods is not ideal. It has, therefore, been necessary for farmers to change their habits formed through years, from making good horse hay to making the crop more suitable for dairy cattle, to which it is now mostly fed.

With 85 per cent of the tillage land in New Hampshire in hay, and with most of this hay composed of timothy and other grasses, it seemed advisable for the New Hampshire Station to study the problem of how timothy and other grasses can be made most suitable for cow feed. Accordingly, studies have been made on the com-

position of hay cut at different dates and the digestibility of the crop harvested at different intervals. We also are studying the effect of different nitrogen carriers on yield, comparing the quantity of hay is sufficient, so that an improvement in the quality of the crop will be reflected in the necessity for buying less grain on the farm during the winter months.

On these small plots at the New Hampshire Station, timothy has been cut at different dates for five years.

them with complete fertilizers, and checking up on the influence of top-dressing on the composition of the hay produced. Our aim has been to find out how to make the best cow feed from timothy hay, causing it to be as near like alfalfa and clover as possible, by modifying harvesting practices and growing methods.

It was not difficult to find inspiration to do some experimenting with timothy by cutting at different dates. More than 40 years ago Professor Morse of the New Hampshire Station had harvested the crops at different stages of maturity and determined the protein content at the various stages. Moreover, a few farmers had adopted early cutting as standard practice on their farms, but the rank and file of folks in New Hampshire oiled up the mower and went into the field to cut their first swath the day after the Fourth of July unless that fell in the middle of the week, in which case they deferred the evil hour until the following Monday. Now on most farms

The peculiar thing about many crops, and it holds true with timothy, is that the total protein content per acre is as great in the early stages of growth as it is after the crop is past the blooming period. In fact, we have found in our trials that there is a somewhat greater amount of protein per acre in the early than in the later stages, using the period of bloom as the dividing line. This means that where the volume of hay is not a factor the earlier a farmer gets his hay into the barn the better, not only for its protein content, but for its palatability and digestibility so far as the cows are concerned, and for the man's pocket-book as well.

Actually, the way this has figured out over a five-year period in our time-of-cutting trials, where we have cut hay every 10 days from June 10, at which time the heads of the timothy are appearing, until June 30, when the seed is almost ripe, is this: the weight of the hay per acre has increased from 1,880 pounds to 2,803,

while the protein content has decreased from 212 pounds per acre at the earliest date to 153 at the latest. The gain in weight has been rather constant to July 10, after which there is no gain in total yield in these trials, and the decrease in total protein has been consistent and even more rapid after July 10 than it has prior to that date.

The percentage of protein in the dry hay decreased rapidly, varying from 11.26 per cent on June 10 to 9.06 on June 20, 7.57 on June 30, and finally to 5.46 per cent on July 30.

Bulk vs. Protein

What this means is that if a farmer is willing to disregard his former habits of haying in July and cut his grass when it makes the best cow feed, he will sacrifice about 25 per cent in bulk by averaging to cut June 20, but gain 25 per cent in total protein, using July 20 as the average late haying date. His hay if carefully fertilized will carry about 9 per cent protein, which comes closer to that of good clover.

Digestibility trials conducted at the Animal Nutrition Laboratory of the New Hampshire Station indicate that the cows actually digest 62 per cent of the June 20 hay and but 47 per cent of the July 20 harvest, which is a further argument for early harvesting where the hay is to be fed to cows. When these two factors are added together, we find that the June 20 hay is about 50 per cent more valuable per acre for its protein content, cut at the earlier date. The digestibility of the carbohydrates is also better in the early hay.

Objections to the early cutting data have come from farmers who are short of bulk for their cows and also from folks who believe that the weather is better for haying in July than it is in June. To the former objection we have maintained that there is plenty of land that can be rented in the state and on which hay can be grown. To the latter we have cited rainfall records which show over a 40-year period that the June rainfall at Durham has averaged 3.57 inches, while the July precipitation has totaled 3.36 inches for the same period. This almost eliminates rainfall as a factor. We do admit that July is a little warmer on the average. The real reason, however, why June cut hay is more difficult to cure is that it carries more water in its tissues, varying from 68 per cent on June 20 to 49 per cent on July 20 according to our data. This means a little more time and a little more turning, but isn't it worth while for the cows? At any rate more than 50 per cent of all our New Hampshire farmers have shifted from July to June haying, which seems to be proof enough that the practice is sound. This end has been achieved only after five years of extension work based on the experimental data cited above.

Equal to Clover

Even with the data secured from these plots, the extension work might not have been so effective had it not been for the influence of early cutting on second crop yields. As might be supposed, the plots harvested early yielded much more bulk and considerably more protein than those harvested in July. Second crop from the earliest plots yielded at double the rate of the late cut sections, and although the percentage of protein was not so high, the total yield of protein was 60 per cent greater than in the late cut parts.

Hence, the second cutting tends to boost the yield of timothy if hayed early up to within striking distance of the yield where the crop is allowed to approach maturity, with the result that all of the hay if the first harvest is made in June carries an average of 10 per cent of protein, as against an average of about 6 per cent if haying operations do not begin until July. A farmer thus has the chance to conduct his haying operations so as to make

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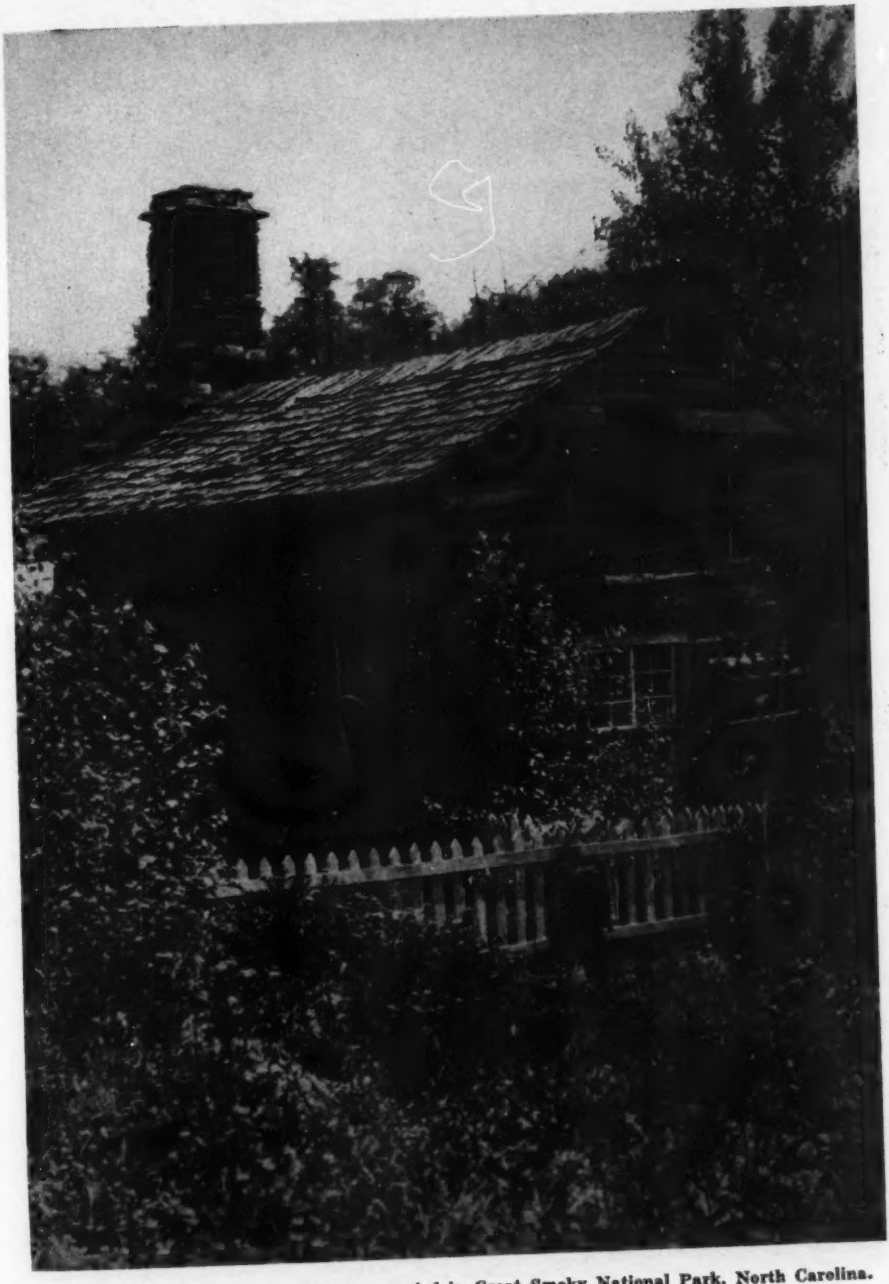
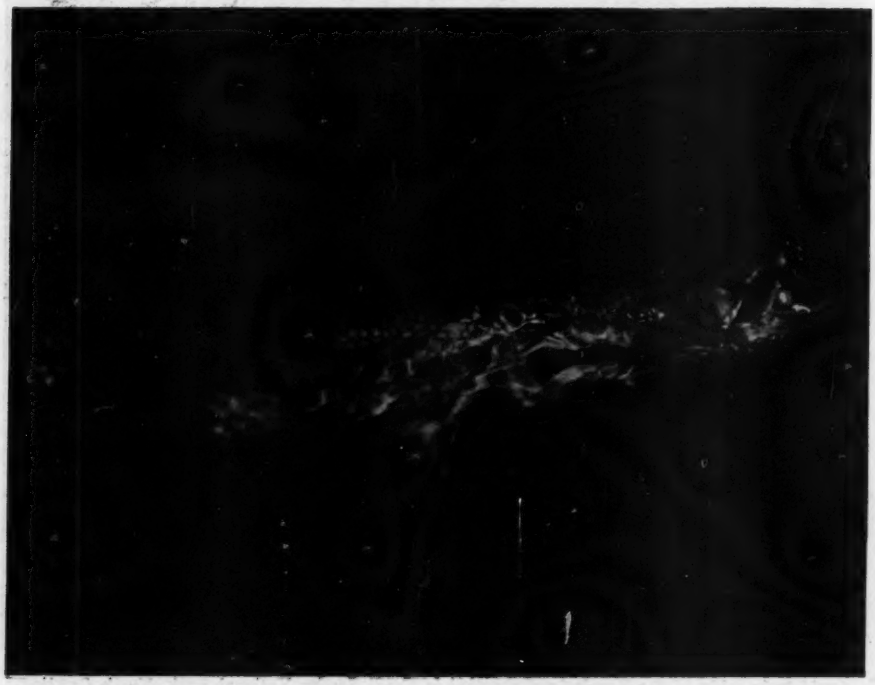
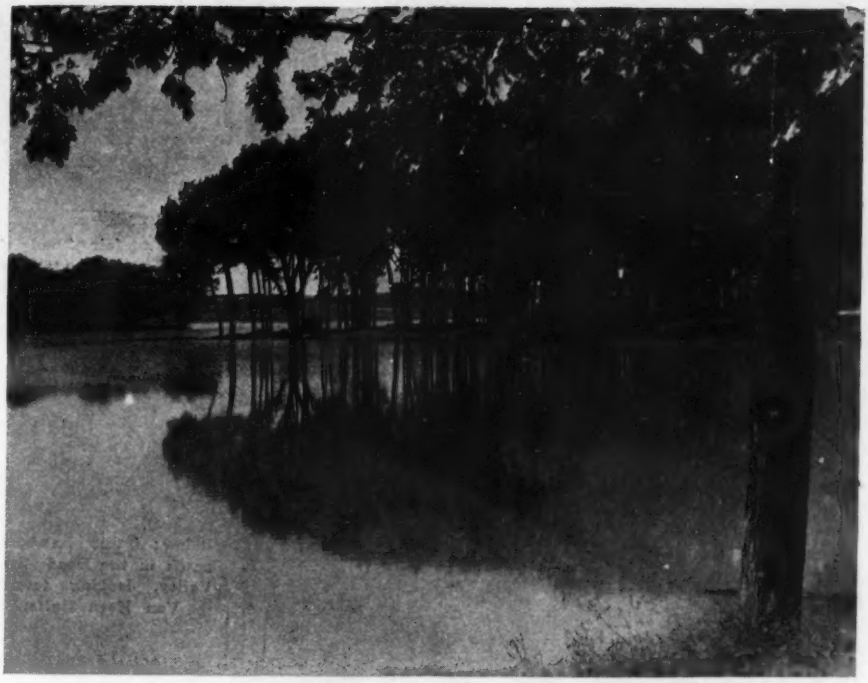
PICTORIAL



An historic cabin of the Revolutionary period in Great Smoky National Park, North Carolina.

Above: Niagara Falls—Mecca of June Honeymooners.
Below: All June thrills are not confined to Niagara.





Above: July reflections in a quiet spot in the Midwest.

Below: A road-side lunch stand in full working order.

Left: A fair "Badger" makes a raid on a Wisconsin strawberry patch.

Below: A fine strawberry patch in the Hood River Valley, looking toward Van Horn Butte.

©Ewing Galloway, N.Y.

The Editors Talk

Cheap Insurance

It takes much less produce to pay for the potash in the fertilizer today than it did four years ago. Not only have potash prices greatly decreased, but prices of farm products have increased during this period. The index number of farm prices at the present time is 104 as compared to 65 in 1932, while potash is now only 45 cents a unit as compared to 70 cents in 1932.

In terms of unit values, one unit of potash (20 pounds K_2O) at the current prices can be purchased with a little more than one-half bushel of wheat, three-quarters of a bushel of potatoes, or four pounds of lint cotton. In 1932, it required more than 11¼ pounds of lint cotton to purchase 20 pounds of potash. This is 7¼ pounds more than it required to purchase the same amount of potash in March 1936. During the same period the amount of corn needed decreased from about 2¼ bushels to .8 bushel, wheat from about 1.58 bushels to ½ bushel, and potatoes from 1.53 bushels to .62 bushel.

The decrease in the price of potash which occurred almost simultaneously with the increase in agricultural prices has brought the potash-crop ratio down to a point extremely favorable to the more extensive use of potash. It is quite obvious that when 11¼ pounds of cotton are required to buy a unit of potash, its intensive use cannot be as profitable as when only four pounds are required for its purchase.

It takes only 2 additional pounds of lint cotton per acre to pay for an additional 2 per cent of potash in a 600-pound application of cotton fertilizer. Extra potash in the fertilizer can be purchased at about the wholesale price. Therefore extra potash is a very cheap insurance against low yields which can be traced directly to a deficiency of potash. This relatively low price of potash represents an opportunity for the farmer to build up the potash deficiency content of the soil in line with the policy enunciated and put into practice by the Soil Conservation Program.

Soil Fertility and By-products

The publicity given the Second Dearborn Conference of the Farm Chemurgic Council has again stimulated the attention and interest of the public in the industrial use of farm crops and their by-products. The press has been full of speculations as to the role chemical research, with resulting industrial usage, will play in the solution of our agricultural economic difficulties. Farmers, with good reason because of the research work already done, are looking confidently to industry to increase its use of materials which can be grown on the farm.

Some stress, but entirely not enough, on the importance of building up

and maintaining soil fertility to further this new interest has been given. A greater realization of this importance must be attained before success to any marked degree can be achieved.

It has been generally accepted that one of the most acute of the current ills of agriculture is the use of marginal land. With this poor land being taken out of production, both of the Soil Conservation Program and the natural working of economic pressure, considerably greater demands will be made upon the soil fertility of the land remaining in production. Profit in the growing of food crops depends upon low-cost production. To a much greater degree will any extensive use of industrial crops and crop by-products depend upon low-cost production because of the competition they face with other low-cost materials now being used by manufacturers.

There may be a general idea that industry is to be interested in any old farm "wastes." Such will not be the case. Quantity, quality, transportation, and cheapness will be factors which will determine the practicability and rapidity with which the farm chemurgic enterprise makes use of farm by-products and crops grown for purely industrial purposes. Already there are instances where costs of collection and purification and the lower yields of desired ingredients of farm wastes have kept them from being used industrially.

In the growing of industrial crops, the same principles apply as in the growing of food crops with the important addition that in the former, crop standards will receive more attention, since the manufacturer quite probably will be much more exacting in his requirements than the casual purchaser of food. This already is being demonstrated, notably in the use of tobacco, and those crop-feeding methods that influence quality will have to be given careful study in the farm chemurgic program.

If industry begins using farm products, it will demand a high and especially a uniform quality to meet the requirements and standards of manufacturing methods. Manufacturers are accustomed to industrially controlled materials in their plants, and if agricultural materials are to compete with these, they will have to be equally uniform. Experience has shown that uniformity of production of farm crops is best obtained by the use of approved varieties, advanced cultural methods, and the proper fertilization of the crop.

On the other hand, as a practical factor in farm chemurgic research there must be a recognition of sufficient return to the farmers to enable them to keep their soils in a high state of fertility. Only with such insurance can any degree of the reliability on supplies of raw materials, so essential to the development of a new industry, be reached. Therefore it is just as important, and perhaps more fundamental, for farm chemurgic interests to concern themselves with soil fertility as with chemical utilization, for the two are closely allied.

Vacation Time

Because so large a percentage of the readers of BETTER CROPS WITH PLANT FOOD are teachers of vocational agriculture and county agents whose time in the summer when not taken up by vacations is largely devoted to field work, we shall publish only two issues of the magazine during the summer months. You will note that this is the June-July issue. In August will appear the August-September number. Our subscription price is based on 12 issues of the magazine, so that no one will miss copies of the magazine for which they have paid.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

A great deal of information that should aid Michigan farmers in determining the most profitable use of fertilizers for their crops is found in Michigan Extension Bulletin No. 159, entitled "Fertilizer Recommendations for 1936," by C. E. Millar, G. M. Grantham, P. M. Harmer, and R. L. Cook. According to the writers, the method of applying the fertilizer as well as the plant-food content has much to do with the returns received from fertilizer applications. Since various soils have markedly different plant-food deficiencies, the bulletin gives several well-defined charts denoting suitable fertilizer analyses and rates per acre for the different crops grown on sand, sandy loam, loam, silt loam, clay loam, and muck soils. "The increasing use of commercial fertilizers is sufficient evidence that Michigan farmers are finding their use profitable," the authors believe. They state that the fertilizers containing much higher percentages of plant food which have appeared on the market in the past few years supply plant nutrients at a lower cost than the lower analysis goods and are more economical because smaller applications are required. In order to use fertilizers efficiently it is advocated to fertilize the more valuable cash crops heavily in a rotation and supplement the fertilizer remaining in the soil with smaller applications for the less valuable crops which follow. Growers must not expect fertilizers to take the place of organic matter or lime in soils deficient in these materials. In addition to listing the special fertilizer practices recommended for the different classifications of muck soils, the use of lime, sulphur, copper sulphate, and salt in mixtures high in potash is explained. The mixed fertilizers recommended for Michigan crops include 2-12-6,4-16-4, 4-10-6, 0-12-12, 4-16-8, 3-12-12, 2-8-16, 2-14-4, 0-10-20, and 0-8-24 analyses.

An interesting summary of results obtained when different fertilizer materials and mixtures are used for tomatoes is given in Maryland Agricultural Experiment Station Bulletin 386, "Effect of Fertilizer Treatments of Soil on the Quality and Yield of Tomatoes," by R. P. Thomas. This study involved five years field work beginning in 1927 and ending in 1931, and periodic laboratory determinations to measure the influence of fertilizer on canning quality, sugar content, and other fruit characteristics conducive to quality tomatoes. Sassafras loam and sassafras sandy loam soils were used during the progress of the experiment. The author mentions that it has previously been shown that tomatoes respond to fertilizer treatments on Maryland soils; however lower increases in yield may not mean more profits to the grower unless the quality of the fruit is maintained or increased.

Results of the different fertilizer treatments show that a complete fertilizer high in phosphorus and potassium gives most satisfactory returns. Manure alone at the rate of 20 tons per acre gave the highest yields of the

single fertilizer materials used, while a combination of manure and superphosphate resulted in the highest yields on the two soils tested. A 4-16-14 fertilizer applied at the rate of 1,000 pounds per acre was next in yield to treatment which received manure. Because it is often impossible for the tomato grower to obtain adequate amounts of manure, the author suggests a complete fertilizer approximating a 1-3-2 ratio produces most satisfactory yields, which is in line with the recommendations of many other experiment stations.

Laboratory tests indicated that the use of unbalanced fertilizer, such as manure, nitrogen, or potash alone, produces fruit of slightly lower quality when canned. The bulletin concludes that a complete fertilizer treatment that produced high yields also resulted in tomato fruit of good quality.

"Fertilizer and Fertilizer Material," Dept. of Agr. and Industries, Montgomery, Ala., Dept. Bul. 29, Fiscal Yr. 1934-35, R. J. Goode, Commissioner.

"Fertilizing Fruit Trees with Nitrogen," Agr. Exp. Sta., Columbia, Mo., Bul. 363, Apr. 1936, A. E. Murneek.

"Analyses of Commercial Fertilizers, Fertilizer Supplies, and Home Mixtures for 1935," Agr. Exp. Sta., New Brunswick, N. J., Bul. 597, Nov. 1935, Charles S. Cathcart.

"Analyses of Commercial Fertilizers and Ground Bone; Analyses of Agricultural Lime, 1935," Agr. Exp. Sta., New Brunswick, N. J., Bul. 600, Dec. 1935, Charles S. Cathcart.

"Onion Fertilizer Experiments," Agr. Exp. Sta., State College, N. Mex., Bul. 233, Dec. 1935, A. B. Fite.

"Official Report on Feed Stuffs, Commercial Fertilizers, and Agricultural Lime and Limestone—1935," State Dept. of Agr., Columbus, Ohio, Bert V. Leas.

"Commercial Fertilizers—1936," Wis. Dept. of Agr. and Markets, Madison, Wis., Bul. 172, Apr. 1936, W. B. Griem.

Soils

California Agricultural Experiment Station Bulletin 599, "A rating of California Soils," contains systematic ratings of each soil type found in each of 59 soil-survey areas in California, in accordance with the Storie index method of soil evaluation, by Walter W. Weir and R. Earl Storie. The ingenious method of rating these soils consists of a numerical expression of the relative agricultural value of the various soils on the basis of character of the profile, surface texture, and conditions that modify the agricultural uses of the soils. Numerical values assigned to the factors are given in percentages of what may be considered as "ideal" or "most ideal." Numerous tables depicting composite ratings of soil types and phases of the different areas show the grouping of soils, i. e., Grade 1 refers to rating of 80-100 which includes "excellent soils"—above the average; Grade 2, "good soils"—usually suitable for most crops of the region; and so on to Grade 6, which is the index rating less than 10, designated as "non-agricultural areas" such as rough, mountainous land, scabland, and tidal marsh. A brief description of each area is given for the major soil series by groups. The descriptions also name the principal crops of the area. "The tables and descriptions contained in this bulletin," the authors state, "are designed particularly for use in connection with corresponding soil surveys." Soil maps accompany the bulletin.

"The Solubility of Applied Nutrients in Muck Soils and the Composition and Quality of Certain Muck Crops as Influenced by Soil Reaction Changes and Moisture Conditions," Agr. Exp. Sta., East Lansing, Mich., Tech. Bul. 147, Dec. 1935, W. S. Ligon.

"Liming Lawn Soils," Agr. Exp. Sta., New Brunswick, N. J., Cir. 362, Jan. 1936, Howard B. Sprague.

"Revised Nomenclature of Soil Type Names Used in Ohio Soil Surveys," Agr. Exp. Sta., Wooster, Ohio, Sp. Cir. 47, 1936, G. W. Conrey and E. M. Burrage.

"Graphic Summary of Agriculture and Land Use in Oregon," Agr. Exp. Sta., Corvallis, Oreg., Sta. Cir. 114, Dec. 1935, H. D. Scudder and E. B. Hurd.

"Muck-soil Management and Crop-production Studies, Sanpete County Experimental Farm, 1927 to 1933, Inclusive," Agr. Exp. Sta., Logan, Utah, Bul. 267, Feb. 1936, Le Moyne Wilson.

"Soil-management and Crop-production Studies," Agr. Exp. Sta., Logan, Utah, Bul. 270, Feb. 1936. I. D. Zobell.

"Fertility Maintenance by Rotation and Manure," Agr. Exp. Sta., Logan, Utah, Bul. 271, Mar. 1936, D. W. Pittman.

"The Chemical and Physical Properties of Dry-land Soils and of Their Colloids," U. S. D. A., Washington, D. C., Tech. Bul. 502, Dec. 1935, Irvin C. Brown and Horace G. Byers.

"Soil Survey of Ohio and Switzerland Counties, Indiana," U. S. D. A., Washington, D. C., Series 1930, No. 37, B. H. Hendrickson, T. M. Bushnell, H. P. Ulrich, and D. R. Kunkel.

"Soil Survey of Greene County, Mississippi," U. S. D. A., Washington, D. C., Series 1932, No. 5, J. W. Moon and S. Rankin Bacon.

Crops

Growers of asparagus in Texas will profit materially from Texas Agricultural Extension Service Circular C-82, "Growing Asparagus," by J. F. Rosborough. It is declared that asparagus is well adapted to Texas climate because it will stand heat. Neither drouth, high water, nor rather large amounts of alkali affect the crop seriously. Plantings in the winter months are satisfactory where there is no danger of freezing the roots, although spring plantings are recommended. Asparagus will grow on practically any type of soil, but prefers a sandy or sandy loam soil, the author states. Many helpful suggestions pertaining to proper planting are given. Where utmost care in preparing the bed for planting is taken, the crop will normally remain on the soil for 10 to 20 years. An application of 500 pounds of a fertilizer analyzing 6-10-7 per acre at the close of the cutting season is said to be an excellent treatment. Several satisfactory varieties for Texas are listed. Helping hints on harvesting are explained, as are requisites for growing fall asparagus and methods to control insects and disease.

"Grape Growing in Colorado," Agr. Exp. Sta., Fort Collins, Colo., Bul. 424, Feb. 1936, George Beach.

"A Study of Some Abnormalities Occurring in Certain Potato Varieties in Colorado," Agr. Exp. Sta., Fort Collins, Colo., Tech. Bul. 16, Mar. 1936, Rudolph Daniel Anderson.

"Report of the Director for the Year Ending June 30, 1935," Agr. Exp. Sta., Storrs, Conn., Bul. 207, Nov. 1935, William L. Slate, Director.

"Lawn Management," Agr. Exp. Sta., New Haven, Conn., Cir. 113, Apr. 1936, M. F. Morgan, E. M. Stoddard, and R. B. Friend.

"4-H Corn Club Manual," Agr. Exp. Sta., Lafayette, Ind., Ext. Bul. 157 (Third Revised Edition), Jan. 1936, A. T. Wiancko and W. R. Amick.

"Irish Potato Investigations," Agr. Exp. Sta., New Orleans, La., Bul. 272, Jan. 1936, Julian C. Miller and W. D. Kimbrough.

"Annual Report of Maine Extension Service for Year Ending June 30, 1935," Agr. Ext. Serv., Orono, Maine, Ext. Bul. 217, Dec. 1935, Arthur L. Deering, Director.

"Wormseed Oil Production," Agr. Exp. Sta., College Park, Md., Bul. 384, July 1935, G. S. Weiland, L. B. Broughton, and J. E. Metzger.

"Hardy Shrubs for Landscape Planting in Michigan," Michigan State Col., East Lansing, Mich., Ext. Bul. 152, Rev. Nov. 1935, C. P. Halligan.

"Tomato Growing in Michigan," Michigan State Col., East Lansing, Mich., Ext. Bul. 156, Feb. 1936, H. L. Seaton.

"Muskmelon Reminders," Michigan State Col., East Lansing, Mich., Ext. Bul. 157, Mar. 1936.

"Timely Tomato Topics," Michigan State Col., East Lansing, Mich., Ext. Bul. 158, Mar. 1936.

"The Quarterly Bulletin," Agr. Exp. Sta., East Lansing, Mich., Vol. 18, No. 3, Feb. 1936.

"Thatcher Wheat," Agr. Exp. Sta., University Farm, St. Paul, Minn., Bul. 325, Jan. 1936, H. K. Hayes, E. R. Ausemus, E. C. Stakman, C. H. Bailey, H. K. Wilson, R. H. Bamberg, M. C. Markley, R. F. Crim, and M. N. Levine.

"Heart Rot of Balsam Fir in the Lake States, with Special Reference to Forest Management," Agr. Exp. Sta., University Farm, St. Paul, Minn., Tech. Bul. 110, Sept. 1935, Frank Kaufert.

"Vegetable Gardening," Univ. of Minn., University Farm, St. Paul, Minn., Sp. Bul. 174, Mar. 1936, A. E. Hutchins.

"Culinary Herbs," Univ. of Minn., Cir. 54, Mar. 1936, A. E. Hutchins and L. Sando.

"Better Practices in Oat Production," Agr. Ext. Serv., Columbia, Mo., Leaf. 35, Feb. 1936, Ide P. Trotter.

"Rape for Pasture; Oats and Canada Field Peas for Hay," Agr. Ext. Serv., Columbia, Mo., Leaf. 36, Feb. 1936, Ide P. Trotter.

"Seeding Meadows and Pastures," Agr. Ext. Serv., Columbia, Mo., Cir. 335, Feb. 1936, C. A. Helm.

"Forty-ninth Annual Report," Agr. Exp. Sta., Lincoln, Nebr., W. W. Burr, Director.

"Grape Growing in New Hampshire," Univ. of N. H., Durham, N. H., Ext. Cir. 173, Dec. 1935, L. P. Latimer.

"Lawns, Their Building and Maintenance," Univ. of N. H., Durham, N. H., Ext. Cir. 177, Jan. 1936, Ford S. Prince.

"Planning the Garden," Univ. of N. H., Durham, N. H., Ext. Cir. 180, Feb. 1936, J. R. Hepler.

"Twentieth Annual Report of the New Jersey State Department of Agriculture, July 1, 1934 to June 30, 1935, State Dept. of Agr., Trenton, N. J., William B. Duryee, Secretary.

"Soil, Field-crop, Pasture, and Vegetable-crop Management for Delaware County, New York," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 639, Nov. 1935, A. F. Gustafson, D. B. Johnstone-Wallace, F. O. Underwood, C. S. Pearson, and F. B. Howe.

"Fifty-fourth Annual Report, 1934-1935," Agr. Exp. Sta., Wooster, Ohio, Bul. 561, Jan. 1936, C. G. Williams, Director.

"Iodine Content of Oklahoma Vegetables," Agr. Exp. Sta., Stillwater, Okla., Bul. 229, Nov. 1935, V. G. Heller, Maurine Jones, and Lee Pursell.

"Department of Agriculture Bulletin," State Dept. of Agr., Salem, Ore., No. 52, Apr. 1936.

"The Cotton Contest—1935—for Better Yield and Staple Value," Clemson Agr. Col., Clemson, S. C., Cir. 146, Feb. 1936, R. W. Hamilton and B. E. G. Prichard.

L-6, "Important Steps in Growing Cotton," L-7, "Important Steps in Growing Corn," L-8, "Important Steps in Growing Grain Sorghums," and L-10, "Important Steps in Growing Sweet Clover," A and M College, College Station, Texas, E. A. Miller.

"Irish Potato Production," Agr. Ext. Serv., College Station, Texas, V-85, 1936, R. R. Reppert.

"Watermelon Growing," Agr. Ext. Serv., College Station, Texas, C-87, 1936, R. R. Reppert.

"Alfalfa Seed Investigations and Other Crop Varietal Studies, Millard County, Utah, 1929 to 1933 Inclusive," Agr. Exp. Sta., Logan, Utah, Bul. 268, Feb. 1936, George Whornham.

"Dark-fired Tobacco," A and M College, Blacksburg, Va., Bul. 139, Dec. 1935, W. H. Byrne and B. G. Anderson.

"Flue-cured Tobacco," A and M College, Blacksburg, Va., Bul. 138, Dec. 1935, W. H. Byrne and T. L. Copley.

"Department of Agriculture-Immigration of Virginia," Richmond, Va., Bul. 336, Apr. 1936, and Bul. 337, May 1936.

"Growing Alfalfa in West Virginia," Col. of Agr., Morgantown, W. Va., Cir. 312, Feb. 1936, R. J. Friant and R. J. Garber.

"Vine-mesquite for Erosion Control on Southwestern Ranges," U. S. D. A., Washington, D. C., Leaf. 114, Barnard A. Hendricks.

"List of Bulletins of the Agricultural Experiment Stations for the Calendar Years 1933 and 1934," U. S. D. A., Washington, D. C., Misc. Pub. 232, Catherine E. Pennington.

Economics

"An economic Study of the Potato Enterprise in Michigan" is the title of a recent publication (Sp. Bulletin No. 267, by P. F. Aylesworth of the Department of Farm Management of Michigan State College. The study should attract wide attention in view of the importance of the crop in the state and the high ranking position of Michigan in the potato industry. From 1925 to 1934 Michigan had an average of 246,400 acres in potatoes and produced about 24,000,000 bushels.

There has been no trend in potato production in the United States, however, production has fluctuated widely. During years of comparatively stable commodity prices, potato prices varied inversely with production. Potatoes do not enter into international trade to any extent, and there is no carry-over into the next crop year. The demand for potatoes does not change greatly from year to year, therefore small crops consistently return higher gross income to farmers than large crops.

One of the most significant aspects of the potato price situation is the tendency for prices to be higher at the end of the marketing season when the crop is small and to follow the opposite course in large crop years.

Records were secured from the eastern, western and northern areas of the state and from table stock producers and certified seed producers. It was found that the table stock producers had a total production cost of $43.22 per acre, a yield of 126 bushels, and a cost per bushel of 34 cents for field run potatoes at the farm. The yield varied from 24 to 381 bushels. The cost per acre varied from $19.48 to $134.55.

The average cost per acre for the certified seed growers was $82.81, the yield 241 bushels, and the cost per bushel 34 cents for field run potatoes at the farm. The range was from $29.38 to $154.96 per acre for costs and 75 to 615 bushels for yield.

Factors of efficiency which the producers are able to control are: fall plowing when land is not subject to erosion, early planting, the use of good quality seed in sufficient quantity, seed treatment, proper use of fertilizers, use of barnyard and green manure, efficient use of power and labor, and thorough methods of culture.

"Agricultural Planning," Agr. Ext. Serv., Manhattan, Kans., Cir. 121, Nov. 1935, B. W. Wright, Vance M. Rucker, J. A. Hodges, and C. R. Jaccard.

"Land Economic Survey, Hubbard County, Minnesota," Agr. Exp. Sta., University Farm, St. Paul, Minn., Bul. 317, Mar. 1935.

"Farm Prices of Cotton Related to Its Grade and Staple Length in the United States, Seasons 1928-29 to 1932-33," U. S. D. A., Washington, D. C., Tech. Bul. 493, Jan. 1936, L. D. Howell and John S. Burgess, Jr.

One Plowing of Potatoes Enough, Except for Weeds

IF WEED control in potatoes is not a major problem, the extra work of more than one good, deep cultivation probably will not pay. In a 3-year test by the United States Department of Agriculture at Presque Isle, Maine, one-cultivation potatoes yielded slightly more on the average than potatoes cultivated five times.

In both cases there was a light cultivation 2 weeks after the potatoes were planted and before they were up. The one-cultivation potatoes were well ridged. The potatoes cultivated five times were ridged moderately. Both plots were hand-hoed once to kill weeds.

When cultivation is necessary to control weeds, it should be shallow. Deep cultivation prunes the potato roots and the freshly-tilled soil loses moisture. These cultivation experiments were on fall-plowed sod land fitted in the spring for a good seed bed.

Up to 10 or 15 years ago, farmers and crop specialists believed that row crop tillage aerated the soil, conserved moisture, increased availability of plant food in the soil and suppressed weed growth. Other studies besides those on potatoes indicate the fallacy of some of the supposed benefits from frequent tillage.

Pasture Use Cuts Feed Costs on Cotton Farms

THE cotton farmer who makes the greatest possible use of good pasture in keeping his mules, feeds about one-third less hay, as well as less grain, per animal than is eaten by the average cotton-farm mule, on the basis of a survey by the United States Department of Agriculture on 161 Arkansas and Mississippi Delta plantations. Feed costs for work animals can be lowered in many sections by more use of improved pastures, say Department men.

In addition, pasture improves and saves from erosion land retired from clean cultivated crops for soil conservation purposes.

The average work mule on the plantations studied by the Department, in cooperation with the Arkansas and Mississippi experiment stations, eats about 6,000 pounds of hay and about 3,000 pounds of grain a year. He works the equivalent of one hundred and twelve 10-hour days each year, most of which is during the grazing season of about 224 days. Some farmers extend this grazing season with winter-growing forage.

On the days on which the average cotton plantation mule is NOT working he generally should be on pasture and usually could be. As a matter of fact he is pastured only about 34 days a year. If he were pastured on the days when he is not used as well as at night during the working season, it is estimated that one-third the hay and forage now fed during a year—as well as much grain—would be saved. On many plantations this would be cash saving, because most of the hay and grain fed is bought and shipped in from other States.

The Role of Potassium in Plant Nutrition

(*From page* 8)

cluded here was made on the S. D. Mustard place near Powell Butte, Oregon, in the Deschutes region, giving further indication that the economic rate of potash application for potatoes was nearer 80 pounds per acre than 160.

A summary of fertilizer trials in the Deschutes Valley, Oregon, indicates that potash can be used on staple field crops in the Deschutes section when crop prices are good. The soils there respond to sulfate so that the sulfur in sulfate of potash has some value on that soil.

TABLE II. MINT YIELD AND OIL CONTENT WITH DIFFERENT TREATMENTS
(The Hayes Ranch, 1929)

Treatment	Lbs./Rod raw green	Lbs./Ac. green	Oil per cent in green mint	Oil per acre, lbs.
None	20	20,000	.289	57.8
KCl and Manure	24	24,000	.293	70.3
KCl and $NaNO_3$	24	24,000	.311	74.7
Complete (N-P-K)	23	23,000	.235	54.1
KCl	23	23,000	.287	65.1
None	21	21,000	.280	58.8
K_2SO_4 and Magnesium Limestone	28	28,000	.328	91.9
K_2SO_4	29	29,000	.253	73.4
Inoculated with upland soil	28.5	28,500	...	...

TABLE III. MINT FERTILIZER EXPERIMENT
(The Herrold Ranch, 1932)

Treatment	Oil c.c. per 10 lbs. hay	Fresh hay 1 sq. rod, lbs.	Sp. gr. 25° C.	Ref. index at 20° C. Abbe	Optional rota at 25° C.	Esters as menthol ester by sapon., per cent	Total menthol per cent
None	2.4	16	.9050	1.4642	—25.0°	6.88	53.12
KCl	2.35	92	.9040	1.4838	—32.25	6.66	58.39
KCl and K_2SO_4	2.20	96	.9065	1.4645	—29.7	7.94	55.08
KCl and Manure	2.85	58	.9050	1.4642	—30.7	8.16	56.70
KCl, Manure, Lime	4.45	136	.9040	1.4641	—34.0	8.18	58.58

The placement of potash fertilizer with deep-rooted crops may be a factor in its effectiveness. Certain northern California soils that are high in calcium and have been employed in the growing of nuts and stone fruits show high fixing-power for potassic salts. Deeper application under such a condition is reported to be helpful.

Lysimeter data indicate that from 40 (Oregon) to approximately 100 pounds (New York) of potash may be leached from an acre of soil in a year. A 4-ton crop of alfalfa may remove 96 pounds of potassium; 4 tons of clover will remove 120 pounds; 15 tons of corn fodder, 120 pounds; 10 tons of sugar beets, 157 pounds.

Barnyard manure supplies about 8 pounds of potash per ton. Sulfate and chloride of potash each contain 850 pounds or more of potassium per ton. Wood ashes may contain 100 pounds of potash per ton. Full returns from potassic fertilizers are usually realized only when an adequate supply of nitrate nitrogen is present to accompany potassium ion into the plant. Crop rotation with legumes such as clover helps supply the nitrogen needed and its growth and decomposition, and helps in making soil potassium available.

Meet Our Old Friend Timothy

(*From page* 22)

timothy practically equal to clover in feeding value.

There is also a direct relation between the feeding value of the hay and the fertility of the soil on which timothy is grown. A soil well stocked with available nitrogen and other mineral elements not only produces more hay but hay of higher feeding value.

The importance of having an abundance of nitrogen present during the growing season is of paramount importance, since this element causes greater stimulation to growth under most situations than does any other element. A short rotation, frequent manuring, and the utilization of crop residues to maintain the organic matter supply are of great help in promoting good yields with high protein content.

The relation between protein value in fertilized and unfertilized hay may well be illustrated by data from our hay project already cited. The first year these plots were cut at different dates, no fertilizer was used. The following spring they were top-dressed with 240 pounds of calcium nitrate per acre. The percentage of protein at the different dates for the two seasons are given in the following summary:

Date cut	Per cent protein in timothy	
	1930, not top-dressed	1931, top-dressed
June 10	10.01	11.77
" 20	8.03	9.01
" 30	6.65	7.28
July 10	5.60	6.38
" 20	5.09	5.92
" 30	4.74	5.83

Even though the data are for different years, the variations in protein at the different dates are so striking and conclusive as to leave no doubt about the effect of available nitrogen on the analysis of the crop. We might cite other data to prove this point, but the figures we have obtained all lead us to the same conclusion. Inasmuch as protein must be purchased in our Northeastern agriculture, it seems ad-

visable to keep grass yields at a high level in order to raise the feeding quality of the hay and reduce cash expenses.

There is some question about what fertilizer should be used on timothy hay to give the largest yields with greatest economy. There appear to be some situations where nitrogen alone gives the greatest economy. Where the soil is high in minerals and the organic supply plentiful, this is likely to prove true. On the other hand, there are soils where potash is practically as necessary as nitrogen for grass stimulation, judging by certain results we have secured on pasture sods from some of our experimental work.

Data on the kind of fertilizer to use are now accumulating in an experiment at Durham, in which different nitrogen carriers are compared along with an equal quantity of nitrogen in complete fertilizers. The results to date for this test are here given:

One "square yard" of timothy, that on the left fertilized with 400 pounds of 12-4-4, that on the right unfertilized.

Treatment	Yield cured hay, lbs. per acre	Per cent increase over check
200 lbs. nitrate of soda	2,595	31
400 lbs. 8-6-6	3,046	54
400 lbs. 8-6-6 (all water soluble)	3,800	92
Nothing (check plots)	1,979	..

The land was seeded identically, plots being laid out afterward and top-dressed annually. These data indicate not only good stimulation from nitrogen, but from the other elements as well. So far, the response on this grass land appears to indicate a greater stimulation from top-dressing with water soluble materials. They also seem to prove the need for elements other than nitrogen.

Lime, likewise, is necessary to stimulate timothy yields where the pH of the soil falls much below 5.6. We have secured paying returns for a two-ton application on land with a pH 5.2. While we have not been able to check on the feeding value of the hay grown on limed land, it would seem that the calcium from the lime might in itself be a valuable factor. This would hold true for other minerals, especially phosphorus, where used.

Making timothy hay as valuable as clover requires certain changes in farming practice. Chief amongst these are earlier cutting, annual top-dressing, and maintaining the fertility of the soil at a high level with fertilizers, lime, manure, and reasonably short rotations. Farmers who do not believe this might well give it a trial. Others who are skeptical might look into the experimental data having to do with feeding trials.

While this is not an argument against seeding legumes for hay, a practice that is well established, it does provide a way whereby all the hay that is now grown on our Northeastern dairy farms will have the maximum feeding value.

Keeping Up-to-Date With Potatoes

(*From page* 10)

county near Antigo, farmers Felix Zeloski, Prosser Bros., and Joe Igl and Sons raise from 150 to 500 acres of potatoes every year on their farms. They apply from 500 to 1,000 pounds of a 3-12-12 or a 3-9-18 fertilizer per acre.

On heavier soils in the more humid areas, Milward and Brann point out that practically all the fertilizer is drilled along the row at planting by means of a fertilizer attachment to the planter. The fertilizer is fed in an even flow along each side of the row and mixed with the soil on a level with or slightly below the seed tuber. These improved attachments place the fertilizer where it is most readily available to the roots and where it avoids direct contact with the seed tuber. Fertilizers should never be deposited in contact with or directly over the seed tubers, these men say.

Milward and Brann found that the rate of application of complete fertilizer where growing conditions are favorable ranges from 600 to 1,000 pounds per acre. On the lighter sandy soils, in regions where moisture is likely to be deficient, not more than 500 pounds per acre are considered safe.

Where potatoes are planted by hand in check rows, it is also possible to apply fertilizer along the row with cultivators equipped with fertilizer attachment. These machines deliver the fertilizer on each side of the row just behind the tip of the inside shovel. The first application can be made when the field is blind-cultivated. A second may be made during the early cultivation period. Growers on sandy soils who use machine planters, but do not desire to fertilize heavily at planting time, may apply part of the fertilizer during the cultivation period by the above method.

The broadcasting of fertilizers directly to potato land is not generally recommended by Milward and Brann, but is done occasionally where potash and phosphate are used.

Prune Die-back

(*From page* 19)

too low, it has been possible to prevent serious Die-back injury by preventing over-cropping by more severe pruning. The heavy yields in these Die-back areas compared to other prune districts have been definitely traced to the greater percentage of flowers which set and develop into fruits.

Another interesting field observation is the lack of marked symptoms on other fruit trees growing in these soils in which prune trees fail. Peaches and almonds are widely planted, yet exhibit no definite signs of injury. However, when almond or peach trees are grafted to prunes and these subsequently come into bearing, symptoms of Die-back become manifest. The trouble is distinctly a nutritional trouble of the prune tree.

Many trials with other fertilizer salts and such soil amendments as lime, iron sulphate, sulphur, applications of barnyard manures, and other organic materials have been made, but any beneficial effect has been distinctly limited to those materials containing potassium.

In order to be doubly certain that the Die-back symptoms were due to a soil condition, a 7-year-old prune tree with a Die-back history was boxed in the orchard, moved 100 miles to the

Experiment Station at Davis, and replanted in a better soil. The tree has continued to improve and exhibits no symptoms of scorch.

Professor D. R. Hoagland, of the Plant Nutrition Division, has independently demonstrated that potassium corrects the scorching of prune trees growing in these soils with tank experiments. Soil was removed from the field from Die-back orchards and placed in large containers. Prune trees were planted, scorch symptoms became evident, and were corrected by potassium additions to the soil. There is, therefore, much evidence that Die-back of prune trees is a potash deficiency, and yet the case is not closed. The failure to secure complete recovery in the field by applications of potassium salts is still a challenge.

The heavy bearing of the trees may be the explanation in the experiments to date. Heavy cropping may result in a weakened root system deficient in carbohydrates and lacking sufficient energy to extend and avail itself of the potassium added.

The investigation is being continued. The original experimental orchard shown in Figure 2 has been replanted and some of the trees are receiving potassium fertilizers from the time of planting long before any injury may become apparent. Whether this and other early treatments will give us the complete solution can only be answered at some future day by these prune trees.

The Inquiring Mind

(*From page* 16)

in 1934. During that one rain one farm on those fertile slopes lost 500 tons of top-soil per acre. An acre-inch can be computed as weighing 167 tons, so this farm lost nearly 3 inches of its top-soil in one rain! It is bewildering and terrifying how fast soil goes out once erosion gets really accelerated. Consider the San Simon wash in Arizona. Plowed out in 1889 as a little ditch, it got going strong by 1900, and today that wash is 75 miles long, and as much as 400 feet wide and 30 feet deep in places. Besides that, about a quarter-mile strip of soil along both sides of the wash has been ruined.

In 1929 soil surveyors had just finished a detailed survey of the Rio Grande of New Mexico and Arizona. A very heavy rain threw the Gila River into a flood that destroyed towns, lives, and property and inundated a stretch of country 40 miles long and 2 miles wide. The deposit of clay from that one flood was 14 inches deep over a large part of this region of 80 square miles. The soil surveyors had to start all over again. Types which had been mapped as Anthony sandy loam had to be remapped as Gila clay, and in some cases where there had been clay before, there was a deposit of 7 feet of sand, all from one flood.

Eight miles west of Lumpkin, Ga., is the largest man-made gully in the world. This chasm is 200 feet deep. And how do you suppose it started? It started from the drip from the roof of a barn 50 years ago! Since then it has swallowed the barn, a schoolhouse, a tenant house, and a graveyard with 50 graves. In addition to this huge gulch there are thousands of others nearly as large, with the result that 70,000 acres of the best farm land in the region have been destroyed in one county.

We could go on and on, quoting an almost endless list of instances similar to those mentioned, but space does not

permit. From these statements it can be seen, however, that the problem of erosion is not only one of extreme gravity, but a problem the nation has taken very little interest in. At the present time numerous areas which are entirely too steep and erosive for safe tillage, even with the best protective measures we know, are being cultivated throughout our farming regions. These, of course, should be used only for pasture or for trees. Vast areas of eroding lands, which could be given efficient protection with cheaply constructed field terraces or contour embankments, are in cultivation. This implement of soil conservation is now being extensively used in parts of the southern states. In 1927, 494,000 acres were terraced in Texas alone, and a drive is on to largely increase the yearly program. The farmers there have been shown what terracing means in saving fertile soil and in storing moisture in the ground for subsequent crop use.

Not a New Idea

Field terraces have been in use in parts of the older southeastern states for 75 years and, when properly constructed, have saved a great deal of land. At the Spur Erosion and Water Conservation Station in western Texas the yields of cotton have been greatly increased by the use of terraces. With level terraces all the rainwater was held in the fields in 1927 and 1928 on slopes ranging from 4 to 5 per cent, and with it, of course, all the soil that would have been washed away on unprotected areas. The yield of alfalfa also was largely increased. Terracing has been emphasized as a means for saving soil and water because these structures are efficient for many kinds of land, and also because they can often be cultivated over about as easily as any other part of the field.

Under the direction of Hugh Bennett the work is now going on in practically every part of the country. And in his tireless way he is experimenting, making speaking trips, trying new methods, teaching his efficient helpers the best known methods of preventing erosion, saving thousands of acres of land that would soon be worthless—going on and on in the work that he has loved since he was that little boy with the mule in North Carolina. A great deal remains to be done. There must be employed, as a matter of course, various types of dams and flumes to check the expansion of various types of gullies. Grazing must be regulated on the ranges and in the pastures. Trees and grass must be resorted to in order to save the steeper slopes. Certain vines, grasses, and trees will be needed to save the steeper slopes. Even chemicals will be used in some cases. There is still a great need for improved terracing implements. And there is vast need, too, to obtain fundamental data relating to the physical processes involved in erosion, and about which so little has previously been done—for instance, why some soils erode faster than others, why a terrace that functions admirably in one place fails in another with the same slope and rainfall, why vast areas of formerly cultivated land are now lying idle. We need additional information relating to the connection between eroding lands and floods.

Hat on—Ready to Go

The task of putting chains on the evils of soil erosion on a large scale is a mammoth undertaking. It is taxing the best efforts of Hugh Bennett, even with the widespread cooperation of soil scientists, practical agriculturists, extension agencies of the nation, bankers who are insisting on erosion control work before they will make farm loans, merchants who have suffered losses of income because of unproductive lands, railroads which have lost traffic—and in many instances have lost their roadbeds—because of the ravages of nature. The

program should have started years and years ago, and we all certainly are indebted to Hugh Bennett for his untiring efforts to get the program under way, and for his mammoth attack on the forces that have done so much damage.

And now to return for a minute to the man who is in back of all this soil control work. Wellington Brink, writing in the January 1936 number of *Holland's Magazine,* says of Hugh Bennett, "They didn't give him much time to rest on his laurels or become acquainted with his wife, his son, and his daughter. Bennett had a set of golf clubs once, and he broke them all. He goes hunting, and the birds, he says, are usually safe. He gets his excitement as he goes along, whether it be buying parched beetles at 5 cents a bag on a village street in Ecuador, as one would buy peanuts in Birmingham or Atlanta, or watching a duel between a hairy tarantula and the *caballo de diablo* in Cuba.

"His vision has ample outlet. As I write this, 40,000,000 acres on 40 great watersheds are being used to demonstrate approved methods of erosion control, involving engineering, forestry, contour planting, restoration of native vegetation, and a great deal else. Men have been sent to foreign lands to bring back plants of promise for barren areas. A natural leader, organizer, a blazer of trails, Bennett has his work cut out for him for the next decade or so. It is up to him to shut the vault door, to find a way to prevent continued staggering theft of the nation's basic wealth—the wealth on which the whole future prosperity of our people depends."

So we take leave of Hugh Hammond Bennett—the epicure, the Carolina mountain boy, the world traveller, the worker—and we show him to you with his hat on, ready to go anywhere at any time to further his great work of Soil Erosion Control.

Potash & Cotton Wilt in Central & North Mississippi

(*From page* 13)

1928 to 1930. The average wilt infection on the check plat which received no fertilizer whatsoever over the 3-year period amounted to 26.28 per cent. That on the plat receiving nitrate and phosphate but no potash was still higher, averaging 31.67 per cent for the three years. This tendency to increased susceptibility over the checks of the plants receiving an unbalanced fertilizer, from which the element lacking was potash, was most evident in 1928, when the former plat showed 60 per cent infection at the end of the season as compared with 40 per cent for the check.

Splitting up Table I into sections on the basis of the fertilizer element in which a variation in amount used occurred, brings out the results secured much more clearly than does Table I taken as a whole. Table I Section A presents an analysis of the effect of varying amounts of potash on wilt infection and yield. It will be observed that, with an increase in potash from 0 to 8 per cent, the proportion of nitrogen and phosphorus

TABLE I SECTION A. POTASH ANALYSIS

Treatment	Per cent Wilt Infection 1928	1929	1930	3-yr. ave.	No. Lbs. Seed Cotton per Acre 1928	1929	1930	3-yr. ave.
4-8-0 ...	60.0	23.0	12.0	31.67	462.0	728.7	300.0	496.90
4-8-4 ...	13.0	9.08	8.3	10.13	987.0	1,135.0	487.5	869.83
4-8-8 ...	15.7	3.40	4.3	7.81	990.0	1,207.5	491.2	896.23

TABLE I SECTION B. NITROGEN ANALYSIS

Treatment	Per cent Wilt Infection 1928	1929	1930	3-yr. ave.	No. Lbs. Seed Cotton per Acre 1928	1929	1930	3-yr. ave.
0-8-4 ...	18.0	8.23	8.3	11.52	777.0	875.0	353.7	668.58
4-8-4 ...	13.0	9.08	8.3	10.13	987.0	1,135.0	487.5	869.83
6-8-4 ...	13.5	5.55	8.0	9.02	987.0	1,135.0	491.2	871.08
8-8-4 ...	15.2	6.03	5.0	8.74	1,008.0	1,135.0	433.7	858.91

remaining constant at 4 and 8 per cent respectively, the average wilt infection was reduced from 31.67 per cent to 7.81 per cent. The yield was increased from 496.9 pounds of seed cotton per acre to 896.23 pounds, an increase of over 80 per cent.

Likewise, Table I Section B presents the results of variation in the nitrogen count. It will be observed that changing the amount of nitrogen from 0 to 8 per cent brought down wilt infection only from 11.52 per cent to 8.74 per cent, or less than 3 per cent, while the yield was increased by only 28.46 per cent.

TABLE I SECTION C. PHOSPHORUS ANALYSIS

Treatment	Per cent Wilt Infection 1928	1929	1930	3-yr. ave.	No. Lbs. Seed Cotton per Acre 1928	1929	1930	3-yr. ave.
4-4-4 ...	17.3	7.67	8.5	11.18	915.9	1,145.4	441.2	834.18
4-6-4 ...	11.0	4.06	6.0	7.02	855.9	1,250.0	395.0	833.63
4-8-4 ...	13.0	9.08	8.3	10.13	987.0	1,135.0	487.5	869.83
5-10-5 ..	8.3	4.43	10.0	7.57	1,082.0	1,322.5	512.5	955.66

No plats were included in the test in which phosphate was omitted entirely, but increasing the phosphorus from 4 to 10 per cent appeared to have relatively little influence on the amount of wilt infection. The effect on yield, as well, appeared to be relatively insignificant. These facts are brought out in Table I Section C.

In Table I Section D is presented an analysis of results secured by varying the rate of application of a 4-8-4 mixture through 600, 900, and 1,200 pounds per acre, respectively. Increasing the rate to 900 and to 1,200 pounds did result in a slight decrease in amount of wilt infection, but it was scarcely large enough to be of significance, and the relatively small difference in yield would not render such increased application practicable.

Summarizing the results secured from this composite fertilizer analysis test with respect to wilt control, it will be observed that the average yield records for the 3-year period corresponded closely with the degree of wilt control secured, with the exception of the plat which received nitrogen and phosphorus but no potash. On this plat the wilt infection was higher than on the check, though, on the other hand, the yield also was higher. This may be accounted for by the very marked increase in vigor and size of the plants on the former plat, due to the nitrogen and phosphorus, which more than compensated for the increased wilt infection. These results would indicate, there-

TABLE I SECTION D. ANALYSIS OF RATE OF APPLICATION OF A 4-8-4

Treatment	Per cent Wilt Infection 1928	1929	1930	3-yr. ave.	No. Lbs. Seed Cotton per Acre 1928	1929	1930	3-yr. ave.
600 lbs. 4-8-4 ...	13.0	9.08	8.3	10.13	987.0	1,135.0	487.5	869.83
900 lbs. 4-8-4 ...	15.0	4.97	6.7	8.89	1,063.9	1,291.2	482.5	945.86
1200 lbs. 4-8-4 ...	17.3	5.10	2.7	8.36	933.2	1,125.0	495.0	851.06

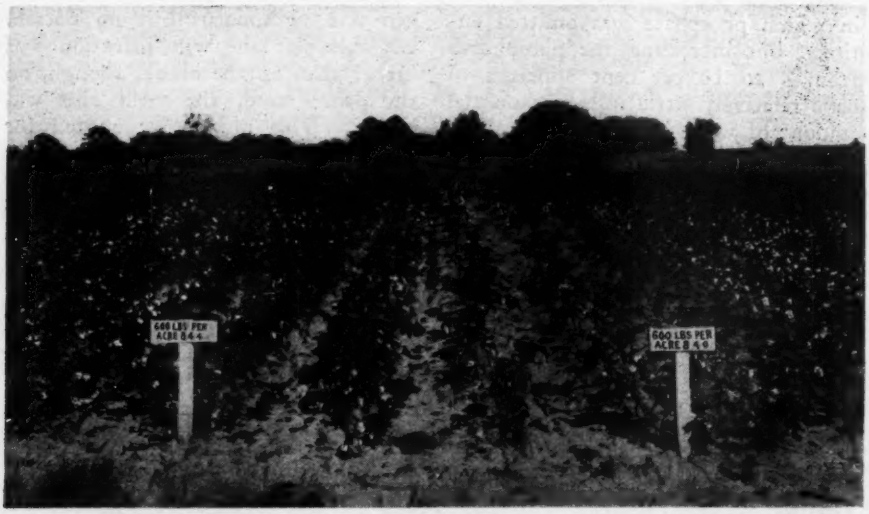
TABLE II. EFFECT OF POTASH ON COTTON WILT AND YIELD AT ENTERPRISE, MISS., 1929

Treatment	Per cent Wilt Infection				No. Lbs. Seed Cotton per Acre			
	Ser. I	Ser. II	Ser. III	Ave.	Ser. I	Ser. II	Ser. III	Ave.
Check	29.0	30.5	24.0	27.8	538	580	560	559.3
4-8-0	20.4	16.8	23.5	20.3	836	894	860	863.3
4-8-2	18.0	16.4	18.5	17.6	900	940	876	905.3
4-8-4	10.0	12.5	17.4	13.3	938	980	950	956
4-8-6	7.0	8.5	9.0	8.1	954	856	980	930
4-8-8	8.0	6.0	5.3	6.4	1,074	1,100	1,050	1,074
4-8-10	10.5	8.0	5.5	8.0	1,050	896	1,000	982

fore, that under the soil conditions at State College, an increase in potash content of the fertilizer mixture to 8 per cent would be justified from the standpoint of wilt control, at least, at the 600-pound-per-acre rate of application of a mixture containing 4 per cent of nitrogen and 8 per cent of phosphorus.

In 1929 a test was conducted in a field at Enterprise, Mississippi, which showed a relatively high percentage of wilt infection rather uniformly distributed over the entire area. A series of seven 1/20-acre plats were laid out in triplicate. A basic fertilizer analyzing 4-8-0 was applied, to which potash was added in amounts varying through 2 per cent intervals from 0 to 10 per cent. The rate of application was 600 pounds per acre. All plats were run in triplicate. The nitrogen was provided by nitrate of soda, the phosphorus was derived from acid phosphate, and the potash from muriate of potash. The results are presented in Table II.

It will be observed that wilt infection decreased with each increase in the amount of potash up to the 4-8-8 mixture, and that yields were increased in direct proportion with the decrease in wilt. There was only one variation from this, and that occurred in the 4-8-6 plat in the second series, in which case the yield was lower than on any other plat in the series with the exception of the check plat, which received no fertilizer. This can be accounted for by the fact that at this point in the field there was a slight depression which allowed water to



Left (600 pounds 4-8-4) wilt infection, 13%—yield, 987 pounds seed cotton. Right (600 pounds 4-8-0) wilt infection, 60%—yield, 462 pounds seed cotton.

stand during certain periods, resulting in a slightly poorer stand of cotton.

The test is in agreement with the one reported above from State College in indicating that where wilt occurs in the soils of central and north Mississippi, the potash content of the 4-8-4 fertilizer mixture, which is probably more generally used on cotton in this area than any other, could profitably be increased to 8 per cent from the standpoint of both wilt control and yield increase, at least at the 600-pound-per-acre rate of application.

In 1929 and 1930 a test of the effect of varying amounts of potash in a mixed fertilizer on wilt control was conducted on the property of Fletcher Norman, Houlka, Mississippi. This was located on what is commonly termed flatwoods or "sticky flatwoods" soil, a Lufkin clay for which the customary recommendation for cotton is a 600-pound application of a 6-8-4 fertilizer mixture. Five plats were laid out, the first as a check with no fertilizer, and the others with a 600-pound-per-acre application of a mixture varying through 4 per cent in potash content from 6-8-0 to 6-8-12. Nitrate of soda, superphosphate, and muriate of potash provided sources for the various elements, nitrogen, phosphorus, and potash, respectively. All plats were replicated three times. The results are presented in Table III.

The highest wilt infection over the 2-year period occurred on the plat receiving the 6-8-0 fertilizer. Its percentage of infection was 51.55 per cent as compared to 39.05 per cent for the check. With the increase in the potash content of the fertilizer the amount of wilt decreased consistently, the percentage of infection becoming less with each increase in potash up to 12 per cent, which was the highest rate used. The yield also responded very favorably to the use of additional potash, increasing with each increment of that element in the fertilizer mixture. The largest increase of all, 624 pounds per acre of seed cotton, an increase of 168.19 per cent over the check, occurred on the 6-8-12 plat. This was an increase of 225 pounds or 24 per cent over the next highest potash rate, the 6-8-8 mixture. This indicated that on this particular soil type and under the conditions of the test 12 per cent potash was not too high, but that on the contrary even higher potash applications would probably have proven profitable.

Low-cost Production

It may seem anomalous and paradoxical, in these days of production control and acreage reduction, to advocate measures to increase cotton production. This viewpoint, however, is without adequate basis of reason and logic from the standpoint of the individual grower. His sole recourse, with the reduced acreage allowed him for cotton, is to produce the maximum yield possible on his remaining acres with the minimum amount of expense. This can be done in a very great number of cases by the prevention of losses due to rust and wilt.

The results presented in this article and in a previous one dealing with

TABLE III. EFFECT OF POTASH ON YIELD AND WILT CONTROL IN FLATWOODS SOIL, HOULKA, MISS.

Treatment	Per cent Wilt Infection			No. Lbs. Seed Cotton per Acre				
	1929	1930	Ave.	1929	1930	Ave.	Ave. No. Lbs. Increase	Ave. Per cent Increase
Check	41.2	36.9	39.05	382	360	371.0		
6-8-0	50.0	53.1	51.55	647	445	546.0	175.0	47.17
6-8-4	30.1	31.9	31.00	801	588	694.5	323.5	87.19
6-8-8	20.0	16.2	18.10	962	639	800.5	429.5	115.77
6-8-12	14.0	12.3	13.15	1,111	879	995.0	624.0	168.19

tests in south Mississippi show that these losses may be very materially reduced in the soils of south, central, and north Mississippi by the use of a suitably adapted variety of cotton which shows a relatively high degree of resistance to wilt, and by using a fertilizer which contains an adequate amount of potash in proper balance with other necessary fertilizer elements. In most cases this will mean that the percentage of potash in the fertilizer mixture should be materially increased over that ordinarily used.

"Quit-uation"

(*From page 5*)

rural and urban girls doing the same thing; and 132,000 city boys over 14 in regular trade schools, afford a slight statistical picture of the popularity of vocational guidance. Yet after all, this whole business gets in its work on only about a fifth or less of the youth of school age who sit with empty hands and drifting minds. And if we reckon in the oldsters who could well stand a little new light in their lives, this whole enterprise is just a good nibble and no more. But let's be happy that a start has been made. It's better to go along carefully than to botch the job with incompetent teachers.

From any sound point of view the vocational trend in public education is wholesome, yet the art of manual and physical science cannot satisfy and round out our lives completely. I feel, as you do, that what society seems to stand in need of now is far-sighted, cool, logical, and ripe thinkers. We need ideas and ideals, well blended and balanced. Riveting attention alone on a nail-head well driven or a seam well made may be the basis of our every-day happiness, but there are indeed other requirements.

Training a series of extra-competent specialists carries its own bag of dangerous dynamite. Too often such folks have no common meeting point except trivial trumperies. Dare I list any of them for fear of offending the golfers, the bridgers, and the quaffers? Many an evening is devoid of conversation and exchange of thought because those present cannot talk, and they abhor thinking—except to pronounce dogmatic and prejudiced fiats on subjects only hastily skimmed. Do we not need some mature thought and adult attention to political science, American problems, literature, art, and perhaps human psychology?

We have had a riot of fun since 1933 with the coterie of alleged possessors of corners on brains. The administration had its quota of them, and now the critical opposition gathers in a group of brain-trusters. Is their function to get new facts not yet known, or is it to fan our prejudices and strengthen our dismal dogmas? If the former is the objective, I am for it on general grounds of more adult education pleasantly partaken; but if their utility lies in substituting somebody else's brains for our own, then please pass the ketchup! Unless we are trained and ready to engage in some constructive thinking for ourselves, a few men with doctors' degrees can't cure us.

It has been said with some truth that our present situation is to learn how to live well amid abundance, and then to devote our leisure time to something besides barren amusements, many of them taken by proxy.

One of the hardest jobs, as we have seen in the AAA efforts, has been to get farmers to accept the theory of leisure. Hard work, long hours, and

manly endurance were the symbols of pioneer effort, and many a household motto over the clock shelf has planted those precepts firmly in the fabric of American principle. As I see it, the dread men had of leisure was that they held idle hands before them. Women usually picked up their knitting or darning, hooked rugs or weaving; but the poor old helpless men folks were up against it on a rainy day. Nobody thought of study, until recently. But as machinery grows in efficiency and land does not expand, there is a time ahead when leisure will be forced on the American farmer whether he wants it or not—and to some extent also on the industrial worker. Are we getting ready to afford mental occupation or new and inspiring tasks for people to do when that time comes?

NOW we need not make any excuses for adult education. It is not true that education belongs to kids and is only a special favor to grown-ups. This idea is something foreign to older ages when adults were scholars. In the spread of Christianity, beginning with Jesus Himself, the rule was to reach adults first and foremost. I believe Socrates and Mahomet did likewise. The Stoic teachers, Abelard, Erasmus, all of the pioneer missionaries, and even Doc Townsend, by gravy, have approached the path of propaganda through the adult route. The people who should be able to make the most of education are the ones right in the front-line trenches. Why should there be any "quit-uation" time?

In going my rounds of modest duties I have often been discouraged about the fixity of ideas in the skulls of some folks. Yet I have not despaired about somebody's eventually overcoming that stubborn and dogmatic adherence to a vacuum of notions. I am not a teacher and can't undertake to argue anybody into reform myself, but I feel that a lot of this rigidity of mind is a surface blemish only. History shows that.

IF WE imagine adult voters don't alter their hunches under continued demonstration that they are wrong, just glance at a few national occurrences. We had liquor definitely barred by national law and constitutional edict, then in a decade we shifted around and repealed the law and amended the Constitution to let "nature take its course." Then I recall how vehemently my old uncle and a lot of my other kith and kin raved in anger over the mere idea of a skirt coming sailing into the sacred fifth ward polling place, where a lot of men smoked campaign cigars and told dirty stories. "Let 'em do their mopping at home; we'll mop up at election time," chortled the old anti-feminines. Our state voted it down a couple of times, and so suffrage for women had a long, hard battle, but finally won.

The income tax, unemployment insurance, old age assistance, and even good roads and automobiles once faced majority opposition, where today they are favored for the most part by our adult citizens. We might add something about face paint, finger-nail polish, and mere loin cloths for female bathing suits being accepted in good form, where once such carryings-on were marks of idolatry. The only regret is that the adult mind changes so slowly! Think of the things we missed! They even have courses in prize-fighting at our big universities. Yes, adults can be educated if properly approached!

One other thing that deters adults from getting their full of life's marvels is an idea that such pursuits are akin to boondoggling. They don't like to be caught learning how to sing, playing the jew's-harp, or dancing the ha-cha-cha. Adults are far more self-conscious than some young folks that

way. Yet I have a friend in the late sixties who insists that we sleep too long, and so he rises at 5 or so each morning, seizes a set of oil paints and an easel, and hikes out to put what he sees, or thinks he sees, on canvas. Another good sign is the hobby show, where mature exhibits range alongside the callow efforts of beginners in their teens. I feel much encouraged over the fact that old folks are forgetting how to "retire" these days. They don't know when they are licked, and believe me that's something. It may even bear some indirect relation to the fact that in my state the average life expectancy has climbed from about 40 years to 55. In other words, there is a wealth of worth in the sentimental song now current to the effect that "if you can't do this or you can't do that, there is one thing we can do, and that is wah - hoo, wah - hoo, wah-hoo!"

Extending our alertness a few years will help us solve some grave problems. We cannot expect the rising generation to do all that alone. As previously stated, if science finds a way to solve the unknown, social and economic problems must yield in time to keen analysis and proper remedy.

THERE is this difference between the two, however. Your soil specialist goes his way without disturbance to find better methods of treatment for the land. Your physicist rises into the stratosphere or splits the atom, and few would hinder him. Your AAA program turns to conservation and nobody's toes are tramped. But when a sociologist or a trained economist has all the facts worthy of winning a case at the bar of public opinion, he has to struggle against stiff odds. He has to educate a mass of adults and get their consent, or the approval of their elected representatives, before any experiments may be performed.

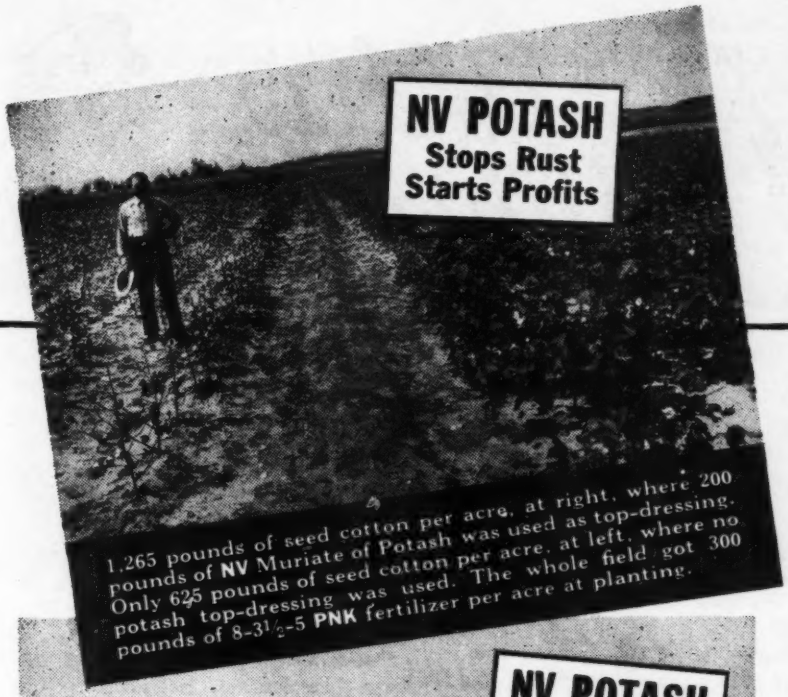
I am not herein defending any and all novel plans of the reform order, but I wish to convey the thought that our children in school are getting more economic and social data as the basis for clear thinking than we used to get, and far more than we absorb ourselves systematically. Sure, we grab hunks of it out of the financial pages or read prejudiced editorials now and then, but how much time do we give to it personally and with an open mind? How much background do we possess for some of our random conclusions?

AND then, when a new law of this character is finally enacted, its future again rests with the proletariat. It is well used or misused, according to the degree of trained sense we have acquired in drafting it and applying it. The Utopia of perfect fool-proof legislation cannot come until adults are in shape to build and use it.

I would depart from common custom now and quote from another noted authority besides myself. This educator writes:

"More mind is the supreme requirement of the present. Mankind is no longer handicapped in its pursuit of welfare by inadequate food supplies, raw materials, or technical devices. It is not for want of these that millions of men are suffering, but from inadequacies in the minds that should dominate these instruments of welfare. And mind is not something unattainable, but something each one of us has in us as a seed or a shoot, eager to grow if we give it light."

In conclusion I would urge us all to be up and doing in behalf of adult education, so that there shall be fewer "quit-uation" days. Yes, even if all talents or sciences are already acquired and stored away. In that case, like myself, perhaps there are certain skills which you have never quite mastered and which since marble-time you have wanted to perform. Such, for instance, as wiggling your ears or whistling through your fingers!



1,265 pounds of seed cotton per acre, at right, where 200 pounds of **NV** Muriate of Potash was used as top-dressing. Only 625 pounds of seed cotton per acre, at left, where no potash top-dressing was used. The whole field got 300 pounds of 8-31½-5 **PNK** fertilizer per acre at planting.

1,293 pounds of seed cotton per acre, at right, where 200 pounds of **NV** Muriate of Potash was used as top-dressing. Only 665 pounds of seed cotton per acre, at left, where no potash top-dressing was used. The whole field got 250 pounds of 10-5-5 **PNK** fertilizer per acre at planting.

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ACCOMMODATION!

House Mother: "Young man, we turn the lights off at 10.30!"

Freshman: "Oh, boy! That'll be keen."

Then there was the Irish tramp in London who consented to give blood to the then very ill King of England. After the transfusion the king was better. A second dose of the Irishman's blood and the king could sit up. With the third dose, he exclaimed: "To hell with the king, anyhow!"

"Henry," said his nagging wife, as he prepared to retire, "is everything shut up for the night?"

"That depends on you," muttered Henry, "everything else is."

SCOTCH DOCTOR

MacGregor and MacPherson decided to become teetotallers, but MacGregor thought it would be best if they had one bottle of whiskey to put in the cupboard, in case of illness.

After three days, MacPherson could bear it no longer and he said, "MacGregor, I'm not verra weel."

"Too late, MacPherson, I was verra sick mesel' all day yesterday!"

Father: "Fancy a big boy like you being afraid to sleep in the dark."

Five-Year-Old: "It's all very well for you; you've got mother to look after you."

Pretty Young Thing: "Are you sure these curtains won't shrink? I want them for my bedroom windows."

Candid Clerk: "Lady, with your figure you should care—you should care."

NATURAL DEDUCTION

The motorist whose car had suddenly come to a standstill quickly diagnosed the trouble, and then applied at a neighboring cottage for assistance.

"Pardon me," he said to the old lady who answered the knock, "do you by chance have any lubricating oil?"

The old lady shook her head.

"Any oil will do," said the motorist, hopefully—"castor oil, if you have any."

"I ain't got it," said the old lady regretfully, "but I could fix you up with a dose of salts."

"You'd better marry me—eligible men are scarce."

"I suppose I could offer that as an explanation."

A clergyman accompanied by two charming girls stood admiring the beauties of a little stream. An angler passing by said, "Any luck, pardner?"

"Sir?" replied the parson with dignity, "I'm a fisher of men." "Well," retorted the fisherman, glancing admiringly at the girls, "you have the right bait."

"You're quite right, grandpa, about the 'Music Goes 'Round' thing. But 'Ta-ra-ra-boom-de-ay' was no intellectual treat."

Aerial view of hoist and grinding plant at the U. S. Potash Company's mine near Carlsbad, N. M.

BETTER CROPS WITH POTASH

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SIGNIFICANT?

THE German farmer--who, because of the unlimited supply practically at his doorstep, has been able to use potash unsparingly--produces an average of 36 bushels of wheat to the acre; the best average yield the American farmer gets from his land is 11.1 bushels. The comparison is the same with oats (Germany 60.9 bushels per acre; United States 19.8)--and with potatoes (Germany 224.6 bushels per acre; United States 99.6)--and with all other crops for which 1933-4 statistics are available. Can anyone doubt that these much heavier German yields are due at least in part, to the German farmer's more generous use of potash?

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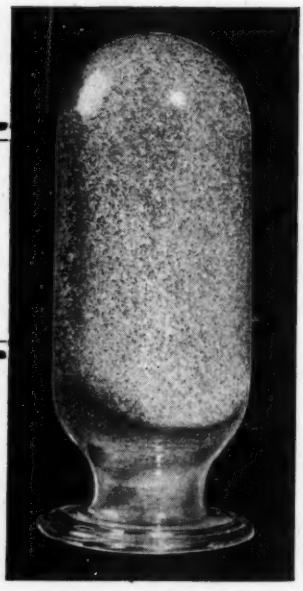

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